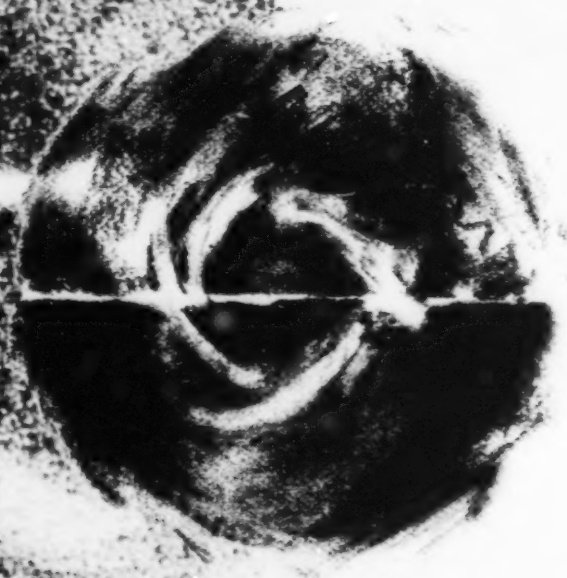




GOVERNMENT OF SASKATCHEWAN
SPECIAL ROUND TABLE ON
SUSTAINABLE DEVELOPMENT AND ECONOMY

Conservation Strategy for Sustainable Development in Saskatchewan



KEY RECOMMENDATIONS

1. The Saskatchewan Government must give an independent body the mandate to monitor and report to the public on progress in implementing the Conservation Strategy.
2. We must improve our decision making through integrated resource management and meaningful public participation.
3. Saskatchewan must have comprehensive strategies to:
 - manage our water resources
 - develop a sustainable energy path
 - sustainably manage our forests
 - minimize and manage wastes
 - protect and rehabilitate our soil resources
 - maintain and enhance Saskatchewan's biological diversity.
4. We must increase the longevity of our non-renewable resources by ensuring that minerals are mined and used in acceptable ways, both economically and environmentally.
5. Individuals must be empowered with the responsibility to create a sustainable future for Saskatchewan.
6. All policies, programs and projects must be evaluated for environmental, economic and social sustainability before their implementation.

ERRATA

Please note that on page 52, point 7 should read:

7. Apply the Conservation Strategy's objectives and principles for sustainable development to all assessment activities.

PREFACE

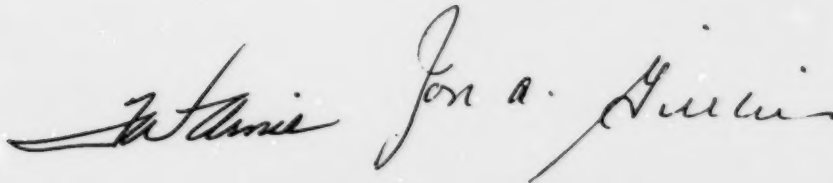
Saskatchewan has been blessed with an abundance of natural resources. However, in 100 years of settlement our natural resources have been degraded. We are borrowing natural resources from our children and we must pass resources on to them in the best possible condition.

To do so, we must change our ways. The Saskatchewan Round Table on Environment and Economy recognizes that our environment, economy and social systems are interdependent. A healthy economy can last only in a healthy environment. If our economy is healthy, we can afford to make wise environmental choices. Our social system also relies on the economy to support our health, education and social services, and we need a healthy environment for our physical and spiritual well-being.

The environment, economy and social systems are all under stress. Now is the time to embrace a sustainable future. The Conservation Strategy for Sustainable Development in Saskatchewan outlines the pathway. It is presented to the Premier and Cabinet and to the people of Saskatchewan for their support and action.

The Strategy incorporates the ideas of 800 people in advisory groups and committees, youth and stakeholder conferences, public meetings and personal contacts. Despite this broad base, we will not move towards sustainability without virtually everyone's commitment and participation.

We wish to thank all participants to date, and we urge each of you to take this Conservation Strategy to heart and make it part of your everyday life at work and at home.

The image shows two handwritten signatures in black ink. The signature on the left is 'Frank Arnie' and the signature on the right is 'Jon A. Gillies'. Both are written in a cursive, flowing style.

Co-Chairperson
Frank Arnie

Co-Chairperson
Jon Gillies

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GEOGRAPHIC SETTING

Saskatchewan covers an area of 651,903 square kilometres, of which 81,632 square kilometres is water. About 90 per cent of this water is in the northern half of the province.

Two distinctive landscapes cover the province. Grasslands dominate the southern half and the northern half is forested. A transition zone called the Parkland belt separates grassland and forest zones.

Vegetative diversity reflects variations in climate. Average precipitation in the south is about 275 mm, increasing to about 450 mm in the north. Average temperatures decrease northward, particularly in the winter.

Aboriginal peoples have long occupied areas of Saskatchewan. They have made their living in both the grasslands and forests.

Beginning in the late 1800s and early 1900s immigration grew, especially with the completion of the Canadian Pacific Railway. In 1901 Saskatchewan's population was about 91,000 residents. By 1931 the population rose to 920,000. Now almost one million people live in Saskatchewan.

Saskatchewan's population is culturally diverse. Saskatchewan has a large aboriginal community of Indians and Metis. The largest, non-aboriginal ethnic groups are British, German, Ukrainian, Scandinavian, French, Dutch and Russian. Several non-European groups are also represented in smaller numbers.

Saskatchewan's economy depends on developing natural resources. Our rich soils, favorable climate and topography support a large agricultural industry. Half of all jobs in Saskatchewan stem directly or indirectly from agriculture.

The energy sector is the next largest industry. Saskatchewan is the second largest producer of oil in Canada. The province also has significant resources in natural gas, coal, uranium and hydroelectricity.

Many minerals, including potash, sodium sulphate, salt, copper, zinc and gold are important in sustaining the mining industry in Saskatchewan.

Other important economic sectors are forestry, tourism, construction, manufacturing and education.

INTRODUCTION

"Our land, compared with what it was, is like the skeleton of a body wasted by disease. The soft parts have vanished, and all that remains is the bare carcass." This lament, which could have been quoted from a contemporary ecologist, was actually sounded in the fourth century B.C. by the Greek philosopher Plato, who was mourning the deforestation and erosion of his native Attica.

Similarly, the famed Cedars of Lebanon used by ancient shipbuilders and palace architects were already severely depleted during biblical times. Environmentally-related problems have contributed to the demise of entire civilizations. The decline of Mesopotamia four millennia ago has been associated with the salinization of soils, attributed to unsound irrigation techniques.

These examples illustrate the historical nature of our environmental dilemma and remind us that modern humanity has no monopoly on the problem.

While environmental irresponsibility is a prevalent undercurrent in the history of civilization, the current global ecological crisis with its unprecedented gravity traces its roots to the beginning of the Industrial Revolution in the mid-18th century.

This revolution brought explosive population increases, growing cities, technological advances and, of course, industrialization with its accompanying consumption of resources and release of wastes on a scale never before imagined.

Environmental disasters, such as the Love Canal chemical dump, and pesticide contamination helped start an environmental movement. More recently,

problems, such as ozone depletion and global warming, have increased public concern about the environment.

Governments in Canada and other countries are responding to the concern by formulating strategies to ensure the maintenance and, in some cases, re-establishment of a healthy and viable natural environment. Many governments now accept that economic development can continue in the long term only in a healthy environment. The interdependence between the environment and the economy underlies the concept of sustainable development.

The concept of sustainable development was strongly advanced in the World Conservation Strategy (WCS), published in 1980 as a cooperative effort by the United Nations Environment Program, the International Union for the Conservation of Nature and Natural Resources, and the World Wildlife Fund.

The following three objectives form the essence of the WCS and a framework of priorities which should be incorporated into national, regional and provincial conservation strategies:

- maintain essential ecological processes and life-support systems;
- preserve genetic diversity; and
- ensure the sustainable use of species and ecosystems.

The United Nation's General Assembly reviewed the state of the world's environment a few years after the release of the WCS. It concluded that although progress had been made, the environment was still deteriorating and destruction of tropical forests and loss of animal and plant species were actually increasing.

In response, the 38th Session of the UN General Assembly adopted Resolution 38/161 to establish The World Commission on Environment and Development. For three years, the Commission held intensive public hearings and received more than 500 written submissions. In 1987, the Commission released Our Common Future (commonly referred to as the Brundtland Report after the Chairperson, Madame Gros Harlem Brundtland, Prime Minister of Norway).

This report focused on the interrelated elements of population and human resources, food security, species and ecosystems, energy, industry, and the urban challenge, all of which determine the future viability of the environment to sustain human life. These "common" perspectives were selected by the Commission because of their universal relevance and applicability. The Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." More than any previous effort, the Brundtland Report succeeded in raising environmental awareness among people in government, business and the public.

The Brundtland Commission's visit to Canada in May 1986 led the Canadian Council of Resource and Environment Ministers to establish a National Task Force on Environment and Economy later that year. In September 1987 the Task Force issued a report with 40 recommendations. Among them was a recommendation to establish national, provincial, and territorial, multi-sectoral Round Tables on the Environment and Economy. Round Tables were established to serve as forums to discuss environmental and economic issues, and to form a consensus on the development of conservation strategies for each jurisdiction.

The formation of the Saskatchewan Round Table on Environment and Economy was announced in March 1989. Membership of the Round Table at the time of printing consisted of 13 senior decision makers from industry, government, aboriginal organizations, academia, interest groups and the public. The Round Table's mandate has been to develop a Conservation Strategy. The strategy promotes the use and protection of Saskatchewan's resources in a manner that is environmentally, economically and socially sound.

The Round Table established seven objectives as the first step in developing Saskatchewan's Conservation Strategy.

THE OBJECTIVES ARE:

- 1. Protect Primary Resources of Air, Water and Soil**
- 2. Preserve Biological Diversity**
- 3. Use Renewable Resources Sustainably**
- 4. Use Non-renewable Resources Wisely**
- 5. Maximize Energy Efficiency**
- 6. Manage and Minimize Wastes**
- 7. Ensure Social Sustainability**

In May 1990, the Round Table established 11 advisory groups to assess sustainability in Saskatchewan's major sectors. These groups of more than 160 volunteers developed sector reports in agriculture, forestry, manufacturing, tourism, mining, public administration, households, construction and development, transportation, energy, and flora and fauna. They analyzed and evaluated the sustainability of their respective sectors, in terms of the seven conservation objectives adopted by the Saskatchewan Round Table. The 11 sectoral reports were completed and submitted to the Round Table in March 1991.

A draft Conservation Strategy, prepared by the Round Table, was released in September 1991. Public meetings to discuss the draft strategy were held in eight locations across the province from January 14 to February 3, 1992.

Two additional advisory groups were established in 1991. One recommended an education plan for sustainable development, released in April 1992, and the other stimulated youth participation in the review and redrafting of the Conservation Strategy.

The Round Table held a Youth Forum in February 1992, immediately followed by a Stakeholders Conference of key industries, businesses, interest groups, and previous Advisory Group members to review and suggest improvements to the draft strategy.

The Round Table drew upon all these sources in preparing the final Conservation Strategy on Sustainable Development in Saskatchewan.

The purpose of the Conservation Strategy is to focus efforts by government, industry, interest groups and individuals to achieve sustainable development. The Conservation Strategy is intended to provide a framework to help Saskatchewan residents meet their needs without sacrificing the ability of future generations to meet theirs.

Round Table members recognize that substantial efforts have been made to develop our economy without sacrificing the environment. Many of the recommendations contained in this report are presented to encourage new action. However, the Round Table also recognizes and endorses activities already underway to guide us along the road to sustainable development.

PRINCIPLES FOR SUSTAINABLE DEVELOPMENT

Sustainable development is a new concept for many people. It means that when we use resources now, we must not jeopardize the prospects of future generations.

Eight principles form the foundation for developing a sustainable future in Saskatchewan. These principles are intended to be "guideposts" to assess the choices and decisions we have to make about integrating the environment and the economy.

Each time we make decisions we should follow these principles:

1. Environmental / Economic Reality

Our world is limited by its physical, chemical and biological characteristics. We must realize that we cannot afford to continue expanding economic activities which degrade or destroy the environment. Instead, our focus must shift toward economic activities which can be conducted in ways that protect and enhance the environment. Improvements in quality must become the priority for economic development.

2. Environmental / Economic Integration

All our economic activities affect the environment in which we live. We must recognize that what we do to the environment, we may also be doing to ourselves. This interdependence dictates that we must recognize the limits imposed on us by nature when we release wastes and disrupt our environment. We can no longer treat the environment as a free economic commodity.

3. Adaptability

Diversity is crucial for the survival of all plant and animal species. Diversity ensures flexibility and resilience in a healthy environment. We must not reduce biological diversity.

4. Renewability

Many of our needs for materials and energy can be obtained from renewable resources as long as we do not abuse them. We can support ourselves from renewable resources, provided that we are willing to live off the "interest" and not the "capital." We should avoid using non-renewable resources or minimize their depletion by reusing or recycling them.

5. Efficiency

If we want to limit our effect on the environment, we must avoid waste-fulness. We must carry out all our economic activities as efficiently as possible. We should give priority to preventing environmental degradation, because prevention is more efficient than restoration.

6. Stewardship

Our world and the resources and opportunities it encompasses are not solely the possession of our generation. We must consider the needs of future generations and leave them an undamaged or restored environment.

7. Sufficiency

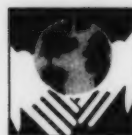
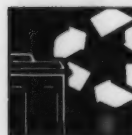
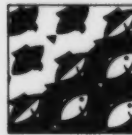
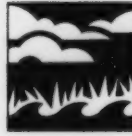
In economic activities, we must give priority to allocating resources to meet real needs. We can emphasize the quality of life we lead more than the quantity of resources we consume.

Becoming a conserver society instead of a consumer society means a change in values and lifestyles. A sustainable society fulfils real needs instead of wants.

8. Accountability

We are all responsible for contributing to humanity's effects on the environment. We must encourage meaningful individual and community participation through informed decision making. We need new initiatives in education, communication, and social and political institutions to encourage environmental awareness and individual and community action.

Conservation Objectives





PRIMARY RESOURCES

OBJECTIVE I

PROTECT PRIMARY RESOURCES – AIR, WATER AND SOIL

AIR

For millions of years, nature kept the air clean. Today, population growth and industrial development have increased the discharge of contaminants into the air. Agricultural operations, energy generation, transportation, manufacturing and other activities release pollution more rapidly than natural processes can filter the air.

In Saskatchewan, air pollution is not yet a major problem. Our sparse population, small cities and environmental standards have helped prevent a serious decline in air quality. However, good air quality should not be taken for granted in the province. There are still internal and external threats to our air – ozone depletion, global warming, acid rain and smog.

The ozone in the upper atmosphere shields the Earth from the sun's ultraviolet rays. In recent years, scientists have discovered that the ozone layer is thinning. Holes have been detected above the Antarctic, allowing more ultraviolet radiation to reach the Earth's surface. Increased exposure poses a threat to human health and crops. Man-made compounds like chlorofluorocarbons (CFCs) and halons seem to be the major culprits. They are used primarily in refrigerators, air conditioners and fire extinguishers. These gases travel upward and slowly break down the ozone.

The Saskatchewan government is part of a national program to phase out CFCs by the end of 1995.

Like the glass panels of a greenhouse, the Earth's atmosphere works as a giant heat trap. It warms our environment and sustains life. Some of the gases in our atmosphere – carbon dioxide, CFCs, methane and nitrous oxide – trap solar radiation and reduce heat loss.

In the last 100 years, concentrations of these gases have increased. Except for CFCs, increases can be traced to the production and burning of fossil fuels. Most scientists say rising concentrations of "greenhouse" gases are causing significant increases in global warming. In Saskatchewan, greenhouse gases may have contributed to recurring regional droughts and high temperatures in the 1980s. Carbon dioxide (CO₂) is the primary greenhouse gas. Saskatchewan has the second highest emission of CO₂ per capita in Canada. Heating homes in cold winters, travelling long distances between communities and other uses of fossil fuels have contributed to this high level.

The federal government has a strategy to limit greenhouse gas emissions by the year 2000. Saskatchewan residents can play an important role in reducing greenhouse gases by decreasing their consumption of fossil fuels. Improved energy conservation is possible without major lifestyle changes. Energy conservation is discussed in the Energy Section of this document.

Acid rain forms when sulphur dioxide and nitrogen oxides mix with water vapor in clouds and settle to Earth as precipitation.

Acid rain is not yet a serious problem in Western Canada but it could damage sensitive areas, such as northern lakes, in the future. The federal government has committed all provinces to a national cap on major pollutants that form acid rain.



Air monitoring in Saskatchewan has been conducted since 1970 to determine the nature and extent of air pollution in major cities. Since 1970, smog (which includes ground-level ozone) has increased each year. However, compared to other provinces, Saskatchewan has low smog levels.

Smog can cause eye irritation, breathing difficulty, and damage to vegetation. Because smog comes from more than one source, it is difficult to control. To reduce it, we may need tougher emission standards and decreased use of fossil fuels.

Air quality in Saskatchewan is affected seasonally by high levels of dust and other airborne particles, including smoke from forest and grass fires. Peak levels occur in the spring and fall. Airborne particles pose a threat to human health and to the productivity of plants.

Public Input

Public consultations stressed that:

- Even though Saskatchewan's air quality is high, we must not be complacent.
- We should reduce all emissions into the air as much as possible and monitor air quality across the province.

RECOMMENDATIONS

- I. *Complete Saskatchewan's Clean Air Strategy to protect and improve air quality in consultation with stakeholders.***

ACTION:

1. Continue the public forum on air quality issues as they affect Saskatchewan.

2. Continue to investigate the impacts of national and international air quality issues and management plans on Saskatchewan.
3. Maintain government support for an inter-agency advisory committee that will coordinate actions in western provinces and territories to ensure consistent transboundary approaches to air quality management.
4. Continue and improve our education programs to inform people about how they contribute to air pollution and how individual decisions can help protect our air.

II. *Implement policies and programs to enhance air quality.*

ACTION:

1. Phase out the use of chlorofluorocarbons (CFCs) and other ozone-depleting substances by 1995.
2. Expand air quality monitoring, evaluation and reporting beyond Regina and Saskatoon.
3. Re-establish acid rain monitoring in northern Saskatchewan by 1994.
4. Encourage the use of energy efficient transportation and alternative fuels and ensure air pollution controls are maintained on all vehicles.
5. Encourage the use of "best available control technologies" in Saskatchewan industries.



III. *Ensure that all government policies, programs and projects do not degrade air quality.*

ACTION:

1. Evaluate government policies, programs, and projects to ensure they do not degrade air quality.
2. Require all government agencies to take air quality into account when planning and undertaking their day-to-day responsibilities.

WATER

Saskatchewan's surface water covers 12 per cent of the province. Most surface water is found in the province's pristine northern lakes, which are the envy of the world. Little water is available in the semi-arid southern half where there are the greatest agricultural and industrial demands. Because the quantity of surface water is limited in populated areas, ground water is important to Saskatchewan people. More than 50,000 wells are in use.

About 60 per cent of the people in rural areas and almost 400 municipal water systems rely on ground water for their domestic needs. Ground water is highly mineralized and stable while surface water has lower mineral concentrations and seasonal variations in clarity, color, taste and odor.

Increasingly limited water sources, strict standards and high costs have made it difficult to develop new water supplies or expand existing systems to meet future needs. Existing water sources need to be managed to protect their long term yield and quality.

Long term policies and programs are required to protect ground and surface water quality. Water for domestic purposes must be given the highest priority.

Many farmers in southern Saskatchewan irrigate because of dry conditions during the growing season. Irrigation projects range from "backflood" types, designed and used by individual farmers, to large-scale, multi-use projects, such as those at Outlook and Luck Lake.

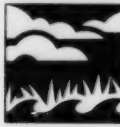
Another form of irrigation uses treated, municipal effluent. Effluent irrigation reduces water pollution and adds nutrients to the soil.

Extended use of irrigation can increase soil salinity, however, and wash minerals into ground and surface water. Keeping irrigated soils sustainable requires careful planning and management.

Public Input

The public expressed these concerns about protecting water:

- To encourage water conservation we must recognize the real value of water and reduce subsidies.
- We must manage water to maintain our ecosystems.



RECOMMENDATIONS

I. *Develop a sustainable water management strategy.*

ACTION:

1. Continue to develop water management plans. They must include all factors affecting surface and ground water in order to develop a sustainable water supply and maintain the province's biological diversity, and pay special attention to shorelines. Watershed management strategies should be developed for and fully integrated with provincial and local land use plans.
2. Designate the Saskatchewan Water Corporation and Saskatchewan Environment and Public Safety to develop the water management strategy.
3. Make water conservation a priority.
4. Make domestic water use the province's priority.
5. Maintain an inventory of current information on water levels and water quality information to provide data for planning and management. Particular emphasis should be placed on gathering information about ground water and northern surface water.
6. Protect the quality of fresh water. Promote integration of waste water disposal and water reuse to minimize pollution and eutrophication (algae bloom).
7. Develop specific water quality objectives to protect our most used bodies of water.

II. *Do not export water from Saskatchewan through interbasin transfers.*

III. *Manage watersheds to maintain the integrity of natural features, ecosystems and shorelines.*

ACTION:

1. Governments must determine the ecological value of water and water systems to protect the ecological integrity of Saskatchewan's natural environment.
2. Designate unique and relatively undisturbed river systems as Canadian Heritage Rivers (for example, the Churchill River). The province must strongly support the Canadian Heritage River System.

IV. *Ensure that irrigation projects are sustainable.*

ACTION:

1. Conduct environmental assessments of all proposed, large-scale irrigation projects.
2. Give preference to irrigation projects which link many initiatives, such as wetland conservation, urban water supply, water for processing plants, and water for diversified crop production.
3. Promote the use of treated municipal, industrial or agricultural waste water effluent as an alternate source of water for irrigation.
4. Modify existing irrigation projects to make them more sustainable.



V. *Ensure that the price of water reflects its real value, as well as the costs of production, delivery and maintenance.*

ACTION:

1. Gradually eliminate subsidies so that prices reflect the real value of water.
2. Establish consumption standards for water-using equipment and develop incentives to promote water conservation and the use of water-saving devices.
3. Evaluate conservation efforts and encourage communities to audit their water use.
4. Develop public education programs to promote understanding of the value of water and ways of conserving and protecting it.

VI. *Protect our surface and ground water resources.*

ACTION:

1. Prevent surface and ground water pollution from landfill sites, underground storage tanks, sewage systems, containment lagoons, injection wells and other sources through site sensitivity studies, good engineering designs and ongoing monitoring.
2. Ensure that water resources are protected from sedimentation caused by soil erosion.
3. Promote greater public awareness of the need to maintain water quality and to preserve water resources through education and demonstration projects.

4. Maintain wetlands to protect water quality and quantity. Stop draining wetlands or filling them with earth.

VII. *Conduct research to improve and protect our water resources.*

ACTION:

1. Conduct research into water conservation, water quality maintenance, the impact of domestic and industrial pollution, water supply and distribution, and the use of geographic information systems in the management of water resources.
2. Evaluate and model the possible effects of global warming and severe drought on water supplies and develop adaptive strategies.

SOIL

Soil is needed to grow food, raise livestock and produce forest products. Some land uses remove soil from production or diminish soil quality.

Soil quality began to decrease with cultivation and summer-fallowing. Tilling upsets the soil's nutrient balance; consequently, soils have lost as much as half their original organic matter. In some areas, inappropriate practices under dry land conditions expose soil to erosion and salinization. About six million hectares of agricultural land are now at risk from wind and water erosion. At least 800,000 hectares of cultivated marginal land should be returned to pastures. Another 800,000 hectares are affected by salinity (salts in the soil).



Soil erosion is not yet a widespread problem in northern forests. But there, too, some areas suffer from erosion when they are cleared of all vegetation.

Soil degradation continues despite the availability of information about soil conservation techniques. Economic pressures often force agricultural producers to break and seed more land, cultivate more frequently, or take short-cuts in soil management.

Farms usually expand onto marginal lands that are not ideally suited to growing annual crops. The use of marginal lands contributes to salinity and soil erosion. Clearing marginal lands may also destroy wetlands or forested areas, affecting waterfowl and often wildlife.

Development – mining, oil and gas production, industrial or urban expansion and road construction – uses up valuable land and sometimes pollutes it with accidental spills. Saskatchewan was settled on areas of high-quality, agricultural soil. To prevent soil degradation and the loss of top soil, we need to consider increasing incentive policies and programs, education programs, and research.

Public Input

The public expressed these views to the Round Table:

- The use of agricultural land for urban sprawl should be prohibited.
- Farmers should be rewarded for maintaining wetlands and they should be fully compensated for damages from wildlife.

RECOMMENDATIONS

- I. *Government, farmers, foresters and other soil managers must adopt sustainable soil management techniques.***

ACTION:

1. Ensure that those who are most affected by soil policies and programs are full participants in developing and delivering them.
2. Evaluate new and existing policies and programs, including economic incentives, for their effects on soil conservation practices.
3. Provide incentives immediately to encourage the adoption of soil conservation practices and the development of conservation planning. Immediately modify programs based on acreage payments which encourage unsustainable soil practices and breaking of marginal land.
4. Develop sound land use plans that provide for soil conservation, including restricting breaking, clearing, draining and other activities that do not maintain soil quantity and quality.
5. Establish environmental codes of ethics for forestry, agriculture and other industries which could affect soil quality or availability.



II. *Enhance the delivery of soil conservation information.*

ACTION:

1. Federal and provincial Departments of Agriculture and the Saskatchewan Soil Conservation Association must provide information to the public about the value of soil conservation practices and public responsibility.
2. Improve technology transfer to enable agricultural producers and foresters to implement conservation techniques.

III. *Continue to support and promote interdisciplinary research and develop initiatives aimed at soil conservation.*

ACTION:

1. Develop and use appropriate indicators to evaluate soil quality and implement soil conservation programs.

2. Monitor rates of nutrient depletion and soil degradation in agricultural and forest harvest areas.
3. Monitor the effects of chemicals on soil quality.
4. Conduct research to determine the most appropriate methods for rehabilitating degraded agricultural lands.
5. Encourage the development and use of technologies and cropping systems which reduce tillage and conserve soil moisture.



BIOLOGICAL DIVERSITY

OBJECTIVE II

PRESERVE BIOLOGICAL DIVERSITY

Biological diversity is the wealth of life forms on the Earth, including plants, animals, micro-organisms, the genes they possess and their habitats.

Biological diversity includes three levels of diversity:

- **Genetic diversity**
is the variability within individuals of the same species and variability between species. Characteristics, such as eye and skin colors, are the result of genetic diversity.
- **Species diversity**
refers to groups of organisms that are so similar genetically that they are able to interbreed, producing fertile offspring. Species diversity is the result of evolution or adaptation over time.
- **Ecosystem diversity**
refers to the different plants, animals, micro-organisms and landscape features that are found in a given area. Ecosystems consist of communities of plants, animals and micro-organisms, interacting with each other and the non-living elements of their environment. We can easily distinguish between a forest ecosystem and a grassland ecosystem. Climatic conditions are the dominant forces that create ecosystem diversity.

The loss of species diversity makes ecosystems more vulnerable to collapse.

Saskatchewan has two main landscapes, forests and grasslands. They are divided into six ecological regions: Cypress Hills, Grasslands, Parkland, Southern Boreal, Northern Boreal, and Sub-Arctic Boreal.

Saskatchewan has about 1,300 species of vascular plants, with 1,250 species of flowering plants, 40 species of ferns and fern allies, and nine species of conifers. There are 78 species of mammals, seven species of amphibians, 12 species of reptiles, 68 species of fish and 242 species of breeding birds. Numerous species of invertebrates and micro-organisms also live here.

Information about many species is lacking although it is essential for making sound development decisions.

Natural processes can create new species and cause others to become extinct. However, human activities have accelerated the loss of species, creating unprecedented rates of species extinction.

Saskatchewan's prairie region is one of the most altered landscapes on Earth. In the past century, more than 80 per cent of the Aspen Parkland has been altered or lost. Only 24 per cent of the original mixed grass prairie remains.

There are many vulnerable and declining species. The following table lists threatened, endangered, extirpated and extinct species. This list is based on the best information available to the Wildlife Branch of Saskatchewan Natural Resources. There are some gaps in our knowledge about the status of many species, especially plants and invertebrates. The Saskatchewan Conservation Data Centre has been established to improve understanding of Saskatchewan's biological diversity.



THREATENED, ENDANGERED, EXTIRPATED AND EXTINCT SPECIES

Threatened

- * Caspian Tern
- Burrowing Owl
- * Sage Grouse
- Ferruginous Hawk
- Peregrine Falcon (tundrus)
- * Bison
- * Western Rattlesnake
- * Eastern Yellow-bellied Racer
- Baird's Sparrow
- Loggerhead Shrike
- Tyrell's Willow
- Athabasca Thrift
- Prairie Longtailed Weasel

Extinct

- Passenger Pigeon

* Asterisks mark species which are threatened and endangered in Saskatchewan.

The loss of natural habitats is the most significant threat to species and ecosystems. In Saskatchewan, the loss has been largely a consequence of agricultural activities.

Pollution is a threat to many species, especially when it threatens the stability of our climate and nutrient cycles. The effects of industrial wastes and agricultural chemicals on ecosystems are complex and not fully understood.

Many non-native plant and animal species have been introduced to Saskatchewan, both accidentally and intentionally. Many plants are important for agriculture, reclamation, shelterbelts, landscaping and other uses. But other species, such as Norway rats and Canada thistles, are undesirable economically and ecologically.

Endangered

- Eskimo Curlew
- Whooping Crane
- * Trumpeter Swan
- Peregrine Falcon (anatum)
- Piping Plover

Extirpated

- Grizzly Bear
- Swift Fox
- Black-footed Ferret
- Greater Prairie Chicken

Uncontrolled hunting and poisoning have destroyed some native species, such as the Plains Bison, Grizzly Bear and Swift Fox. However, improved wildlife management and enforcement have helped protect further loss of species.

Human survival and prosperity depend on biological diversity. Humanity has only begun to tap the Earth's biological diversity. About 75 per cent of our food comes from just seven plant species: wheat, rice, maize, potato, barley, sweet potato, and cassava. Many more of the Earth's millions of plant species could become important for sustenance and economic prosperity.

Wild ancestors of domestic grains must be protected in case of disease, climate changes or other variables. The potato famine in Ireland in the 1840s and the corn blight in North America in the 1970s demonstrate how vulnerable we are to natural disasters when we rely on just a few plant species for food.

Wild plants are needed in agriculture. Improved plant breeding is as important to higher crop yields as irrigation, fertilizers and pesticides. Genes from wild species are also valuable in preventing crop and other plant diseases.

Our biological diversity provides other dividends, too. Recreation, such as bird watching, contributes to the provincial economy. Although its exact value is difficult to assess, recreation is a multi-million dollar industry.

All of the Earth's biological diversity has the potential to benefit humans. We use bee venom to treat arthritis. We study black bears to find a cure for kidney disease. Research indicates that a particular moss may be useful in treating Alzheimer's disease.



We, therefore, need to preserve all of the Earth's biological diversity, not just the species that have current value.

Humanity depends on other forms of life for survival. The economic potential of biological resources can be realized only if biological diversity is maintained. Humans should respect all life forms, regardless of their perceived value.

Public Input

Public consultations brought forward these observations on biological diversity:

- The principal danger to all species is habitat destruction.
- Species should be protected in their natural habitat.
- We do not know the present state of biological diversity: we need to improve our knowledge of its status and distribution.
- We need more research on the effects of pesticides and other chemicals on wildlife, wetlands and habitats.
- We need to emphasize the preservation, conservation and enhancement of plants (flora), as well as animals (fauna).

The following recommendations outline the action that is necessary to protect Saskatchewan's biological diversity.

RECOMMENDATIONS

I. *Manage Saskatchewan's landscape to protect or enhance biological diversity.*

ACTION:

1. Ensure that government agencies take into account biological diversity in their planning and day-to-day activities. Government departments and agencies must integrate their management plans.
2. Ensure meaningful public participation in planning, developing and managing biological resources.
3. Ensure that preservation of biological diversity is a reclamation objective.
4. Establish a provincial list of all known vulnerable, threatened, endangered and extirpated species, and update the list annually.
5. Implement recovery plans for all threatened and endangered species. When feasible, restore extirpated species and restore lost habitats.
6. Ensure that vulnerable, threatened and endangered species are considered in determining protected areas.
7. Protect areas that retain significant biological diversity, including wetlands, rivers and river valleys, and areas with endemic species.
8. Ensure conservation and preservation of Saskatchewan's biological diversity are considered when approving developments.



II. *Ensure that the costs of maintaining biological diversity are shared by all who benefit from it.*

ACTION:

1. Develop incentives that promote conservation of biological diversity on private lands and eliminate contradictory policies and programs.
2. Compensate land owners fairly for crop and other property damage caused by wildlife.

III. *Complete and maintain a comprehensive system of protected areas to maintain the biological diversity of Saskatchewan.*

ACTION:

1. Establish a protected areas system for Saskatchewan by the year 2000, making sure it includes at least one protected area to represent each of the 31 natural zones with a targeted area of approximately 12 per cent of each eco-region, if possible.
2. Identify an agency to be responsible for coordinating the development of a protected area system and for reporting annually on biological diversity in Saskatchewan.
3. Create a committee of government and non-government organizations to advise on the development of the province's protected area system.
4. Establish a biological data management system by the end of 1993 and continue updating the system.

IV. *Ensure that Saskatchewan has adequate legislation and enforcement programs to protect biological diversity.*

ACTION:

1. Legislate an **Endangered Species and Habitat Act**.
2. Designate further exceptional and vulnerable sites under the **Ecological Reserves Act** or other appropriate legislation.
3. Establish a federal-provincial biological diversity committee to review current legislation in order to determine deficiencies or contradictory laws and regulations that affect biological diversity.
4. Reform legislation that conflicts with the objective of maintaining biological diversity.

V. *Promote and support research to maintain biological diversity.*

ACTION:

1. Governments should increase and coordinate research to determine techniques for the sustainable management of ecosystems provincially, nationally and globally.
2. Conduct research to determine the impacts of climate change, ozone depletion, pesticide use, acid rain and other toxic substances.
3. Support research that enhances the use of Saskatchewan's biological diversity for medical, industrial and other uses.



VI. *Ensure that there are effective partnerships for the conservation of biological diversity.*

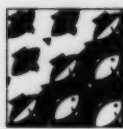
ACTION:

1. Involve all stakeholders in determining and meeting research and information needs.
2. Form partnerships with countries, states, provinces and territories through legislation and formal agreements to protect Saskatchewan's biological diversity.
3. Establish regional partnerships to support development and management of protected areas.

4. Develop a federal-provincial-Indian partnership to ensure the protection of biological diversity on Indian Reserves.

5. Saskatchewan should contribute species and financial resources to global gene banks and maintain wild ancestors of the province's domestic crops and livestock in natural habitats.

VII. *Protect Saskatchewan's ecosystems from the introduction of detrimental non-native species.*



RENEWABLE RESOURCES

OBJECTIVE III

USE RENEWABLE RESOURCES SUSTAINABLY

Ecosystems are subdivisions of the environment. They include all living and nonliving features of a defined area and its biological, chemical and physical characteristics.

Long term economic prosperity relies on the use of renewable resources in ways that are sustainable. Tourism also depends on healthy forests, lakes, parks and wildlife.

AGRICULTURE

Agriculture is a \$4 billion industry in Saskatchewan, producing 50 per cent of all jobs directly or indirectly. About 20 million hectares of land are cultivated (35 per cent of the land). Another 6.5 million hectares support livestock production and forage crops. The success of sustainable development in the province depends heavily on changes in agriculture. The agricultural sector now uses large volumes of non-renewable fuels and other resources. Excessive cultivation depletes the soil and the province's biological diversity.

Agricultural production is affected by domestic and international policies. Acreage-based policies and programs discourage responsible soil conservation. These include crop insurance, Canadian Wheat Board quota and pooling policies, the Gross Revenue Insurance Program (GRIP) and the "Crow Benefit," a subsidy paid to the railway to transport export grains to port. These policies encourage farmers to grow cereal crops on land that is better suited to pastures or forage crops.

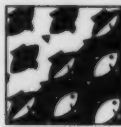
Agriculture has changed the landscape of southern Saskatchewan. Draining and clearing land have diminished wetlands which are needed to recharge ground water and maintain surface water quality. Saskatchewan does not yet have a comprehensive policy to preserve wetlands.

Many policies and programs help owners and land managers use land in a sustainable way. These include the Permanent Cover Program, the Prairie Farm Rehabilitation Administration's (PFRA) tree distribution program, and the Save Our Soils Program. But the long term environmental effects of all policies and programs must be evaluated before they are implemented. Subsidies, too, should promote only sustainable practices.

Conventional farming practices decrease soil quality. When soils are cleared and cultivated, they need costly fertilizers to replace the lost nutrients.

The loss of top soil is perhaps the most serious agricultural problem. Wind and water erosion cost Saskatchewan farmers about \$300 million annually. Poor soil conservation and the cultivation of highly erodible soils compound the problem. Controlling erosion must be a priority for the government and producers. At least 800,000 hectares are now used for crops when they should be used only for forage and pastures.

Rangelands must be managed to sustain grazing. Over-grazing can quickly destroy pastures. Using non-native forage plants can enhance livestock production but these plants alter natural ecosystems. Large portions of native prairie can be sustained as long as over-grazing does not occur and rangelands are managed to maintain native species.



Pesticides are used widely in the agricultural industry. Almost all cereal, oilseed, pulse and forage crops receive applications. But we have no comprehensive pesticide management system.

Agriculture Canada is responsible for pesticide research, development, manufacturing and imports. It determines appropriate use and prescribes labels for each product. Saskatchewan Agriculture and Food licenses commercial pesticide users but not farmers. Saskatchewan Environment and Public Safety regulates the commercial storage and disposal of pesticides and containers but not their use. Saskatchewan Environment and Public Safety regularly monitors surface water for pesticide contamination, but does not monitor ground water.

The effects of pesticides must be carefully researched, and products must be properly used, stored and disposed. Pesticides should be used only by qualified operators. Specific pesticides should be banned in areas occupied by threatened or endangered species, even if only during breeding or nesting periods.

Organic farming has been practised in Saskatchewan for many years. About 300 farms are certified as organic. Organic farmers try to incorporate ecological principles into their practices. Their experience will prove valuable because they know how to reduce inputs for environmental and economic reasons.

Agriculture will remain the foundation of Saskatchewan's economy. To protect Saskatchewan's agricultural systems, we need to improve soil management, develop integrated pest management strategies and make other management changes. Producers and policy makers

must work at developing programs and policies that encourage sustainable resource management.

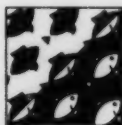
The public must also understand the need to pay for the true costs of agricultural products that are developed from sustainable practices.

Agricultural production may also become increasingly important in multiple land use areas. For example, agriculture and forest products could be harvested from the same area. A farm shelterbelt established to prevent soil erosion and maintain soil moisture could also be harvested for wood. Berry-producing shrubs could be planted in shelterbelts and harvested for extra farm income.

Public Input

Some public comments received by the Round Table were:

- Involve stakeholders when developing strategies to protect soils and harvest forests.
- Apply ecological principles to the management of Saskatchewan's prairie landscape.



RECOMMENDATIONS

- I. *Governments, agricultural producers and other stakeholders must develop a comprehensive strategy to protect and rehabilitate soil resources.***

ACTION:

1. Immediately evaluate policies so that they encourage sustainable soil management. Eliminate policies that encourage non-sustainable soil management.
2. Use appropriate soil indicators to evaluate agricultural methods, including conservation programs.
3. Require the establishment of farm conservation management plans in exchange for the ability to participate in government programs (cross compliance).
4. Return marginal lands which are under cultivation to permanent cover.
5. Government Extension Services should provide information on organic farming.

- II. *Develop comprehensive land use plans to protect prime agricultural land from urban sprawl and other non-agricultural uses.***

ACTION:

1. Government should continue to encourage land use and resource planning at the local level.

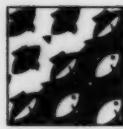
2. Develop overall policies and criteria to ensure orderly development and avoid land use conflicts.
3. Integrated resource management and provincial land use planning should ensure stakeholder participation.

- III. *Governments and agricultural producers must develop improved integrated pest management programs.***

- IV. *Governments must develop a comprehensive pesticide management system in co-operation with pesticide manufacturers and users.***

ACTION:

1. Expand pesticide applicator training programs to include non-commercial users.
2. Develop a comprehensive pesticide monitoring program for both ground and surface water. Develop a pesticide information system to give health and environmental agencies access to all types and amounts of pesticide products used in specific areas.
3. Develop a program to protect threatened and endangered species from harmful pesticides.



V. Governments and agricultural producers must develop programs and policies to ensure the sustainable use of grazing resources.

ACTION:

1. Develop management plans for all Crown grazing lands to ensure sustainable use of grazing resources and to achieve multiple land use objectives.
2. Manage all remaining native rangelands to maintain Saskatchewan's biological diversity. Restore damaged areas to productive rangelands.
3. Retain grazing policies and programs that support retention of native prairie ecosystems.

VI. Governments and agricultural producers must cooperatively develop multiple land use objectives for flora and fauna.

ACTION:

1. Governments should develop comprehensive land use plans for agricultural Crown lands, especially for areas which are currently used for multiple purposes.
2. Government agencies, aboriginal organizations, non-government organizations, and agricultural producers must work together to minimize wildlife damage problems.

VII. Increase research to protect and enhance Saskatchewan's agricultural systems.

ACTION:

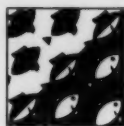
1. Research is required to:

- improve integrated pest management
- identify crops, cropping systems, and agronomic practices that improve and enhance protection of soil resources and increase net farm income
- develop sustainable grazing management practices
- determine the potential for developing renewable energy sources from agricultural products
- discover the effects of pesticides before registration and during and after field application

FORESTS

Designated forest zones cover about 29.9 million hectares (46 per cent) of Saskatchewan's land area, and each zone has distinctive vegetation, soil, animals and water systems. Forested areas include private woodlots, Indian reservations, Provincial Parks, Fish and Wildlife Development Fund lands, and Critical Wildlife Habitat lands. Some areas supply timber. In fact, 13 species of commercial trees grow in our forests. Saskatchewan's forest products were worth about \$259 million in 1988, and one of every 55 jobs is related to forestry.

In forested areas, northern residents and aboriginal peoples rely on hunting, fishing and trapping. Recreational activities, such as big game hunting and fishing, also generate millions of dollars annually.



Forest ecosystems benefit bird watchers, berry pickers and photographers. Forests help maintain our primary resources of air, water and soil. Trees and other forest cover prevent soil erosion, regulate seasonal water flow and help soil absorb moisture. Forests also produce oxygen and absorb carbon dioxide, one of the gases linked to global warming. Forests on Crown lands are divided into Commercial Forest Zones and the Northern Reconnaissance Zone. Most timber is cut in the commercial zone, which represents about 12 per cent of our forested lands.

The Forest Act allows the provincial government to regulate timber harvesting on all Crown lands with Forest Management Licence Agreements (FMLAs), Timber and Forest Product Field Permits, and Term Cutting Agreements.

About two-thirds of the commercial forest zone is under FMLAs. FMLA operators have to submit five and 20 year forest management plans in exchange for secure tenure. The remaining one-third is allocated mostly by Timber and Forest Product Field Permits. Timber permits are required for commercial forestry, while field permits are for domestic wood users. Timber Cutting Agreements approve the harvesting plans of small operations.

Trees and forest products are renewable if forests are properly managed. Perhaps the greatest barriers to sustainable management are our limited understanding of complex forest ecosystems and the lack of an up-to-date, comprehensive forest inventory.

Specific guidelines for harvesting Saskatchewan's forest resources need to be developed. For example, the state of Minnesota has established guidelines prohibiting clearcutting within 150 metres of a bald eagle or osprey nest. Specific

development guidelines are necessary to protect the biological diversity of our forests.

Public Input

The public expressed two different points of view about Forest Management Licence Agreements (FMLAs):

- FMLAs are designed to make forests available for the private sector, not for conservation and sustainable development.
- FMLAs are commonly used as forest management tools, and their performance should be measured against FMLA objectives agreed to by the province and company.

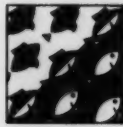
The Round Table maintains that properly designed and administered FMLAs can serve as a vehicle for fully integrated planning and management of all forestry resources.

RECOMMENDATIONS

- I. Use an ecological management approach in planning, developing and managing Saskatchewan's forested lands.***

ACTION:

1. Conduct and maintain a comprehensive inventory of our forest resources.
2. Subject pest control strategies to environmental impact assessment.
3. Determine harvesting practices for each specific area, based on forest type and multiple objectives.



4. Retain soil fertility and natural processes while managing forest resources.
5. Protect lakes, rivers and shorelines.
6. Protect rare, threatened or endangered plants and animals.
7. Maintain native biological diversity and forest productivity as a goal of reforestation.
8. Develop integrated resource management plans for multiple use areas: plans should ensure public and stakeholder participation.
9. Use Forest Management Licence Agreements as the mechanism to achieve integrated planning and sustained forest production in the commercial forest zone.
10. Evaluate intensive versus extensive forest management to determine appropriate approaches. Determine the future role of woodlots in Saskatchewan's forest industry.
11. Ensure stakeholder participation in developing a sustainable use strategy for Saskatchewan's forested lands.

III. *Maintain existing forest fire suppression and increase pest detection.*

IV. *Increased research is required to manage forests on a sustainable basis.*

ACTION:

1. Increase ecologically based forest management research to determine the effects of development, and identify alternative harvesting and reforestation practices.
2. Increase research to better understand the role of fire in ecosystem maintenance and the role fire could play in forest management.

FLORA AND FAUNA

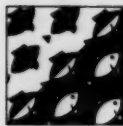
Saskatchewan's plants and animals (flora and fauna) contribute to the province's economy in many ways. Sales of timber products exceed \$250 million each year. More than 100,000 residents hunt, spending over \$50 million. Sport fishing is an important component of tourism, with 250,000 anglers spending about \$71 million here annually. Fur sales generate \$4 - \$10 million, providing income for 17,000 to 20,000 trappers. Hunting, fishing and gathering are vital to aboriginal people and northern communities. Saskatchewan's native flora and fauna are extremely important economically and environmentally. If properly managed, harvesting of flora and fauna will provide long term benefits for Saskatchewan residents. Destroyed habitats and over-use of species will prevent achieving sustainability. Better information is needed to determine sustainable harvesting rates.

The participation of stakeholders and local communities is needed to manage and sustain our flora and fauna.

Public Input

The main ideas raised during public consultations were:

- Flora and fauna and ecosystems are not ours to do with as we see fit.
- We need to improve our understanding of ecological regions and their carrying capacities.



RECOMMENDATIONS

I. *Ensure that renewable resources are used on a sustainable basis.*

ACTION:

1. Complete inventories to determine sustainable harvest rates for flora and fauna. Priority should be given to forest and range ecosystems, native species of fish, and all species used by subsistence hunters and gatherers.
2. Harvest resources on a sustainable ecosystem basis, not on the basis of a single species' sustained yield. This requires a wholistic or integrated management approach.
3. Carefully analyze all costs and benefits before introducing non-native species, and analyze the impacts of accidentally introduced species.
4. Increase training for resource managers and developers to improve the ecological management of flora and fauna.
5. Manage regional renewable resources with stakeholder and public participants.
6. Minimize the effects of linear corridors (roads, power transmission lines and pipelines) on flora and fauna resources.
7. Examine the full costs and benefits of the domestic use of wildlife before expanding game ranching in Saskatchewan.
8. Establish inter-jurisdictional agreements where ecological units extend outside the province's direct responsibility.

II. *Increase research to determine sustainable use rates and to develop management strategies.*

ACTION:

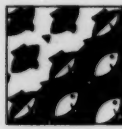
1. Research is required to:
 - determine sustainable harvest rates for flora and fauna in each ecosystem
 - identify cost-effective resource inventory and monitoring mechanisms

TOURISM

Saskatchewan's natural resources attract tourists seeking recreation. They fish, hunt, canoe, camp, ski and explore heritage sites. Tourism generates \$650 to \$750 million annually, supporting 18,000 jobs, directly and indirectly. Travel by residents accounts for 77 per cent of all trips within the province. Tourism in Canada is expected to grow in the 1990s. Given this trend, Saskatchewan should maintain or enhance its tourism. Our forests, lakes and rivers, beautiful landscapes and clean air are highly marketable.

Expanding our Provincial Parks will require Crown ownership of large tracts of land throughout the province. Most cottages are on Crown land, and Crown land protects habitat for wildlife that attracts hunters. Tourism could be expanded in agricultural areas by offering farm and ranch visits.

Farmers, ranchers and aboriginal peoples could play a greater role in tourism because privately owned lands are important for supporting fish and wildlife.



Development must be carefully planned in Saskatchewan to protect the tourism industry. Agriculture, forestry and mining modify natural landscapes, sometimes causing the loss of native species. Because tourism can be affected adversely by other sectors, multiple objectives must be established for given areas and resources. We need a comprehensive approach to managing our resources.

Public Input

The public stressed that:

- We need to recognize the economic opportunities of agri-tourism and eco-tourism.

RECOMMENDATIONS

I. *Protect resources on which tourism depends.*

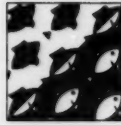
ACTION:

1. Determine the carrying capacity of tourism resources and take measures to prevent the over-use of these resources.
2. Develop strict guidelines and enforcement programs for sensitive sites.
3. Retain Crown ownership of the lands and resources which sustain tourism.

II. *Form partnerships among interested parties to maximize tourism benefits.*

ACTION:

1. Jointly develop a comprehensive strategy for tourism in Saskatchewan to realize increased economic benefits for the province and for Canada.
2. The Tourism Industry of Saskatchewan should endorse the recently developed code of ethics adopted by the Tourism Industry Association of Canada and the National Round Table on Environment and Economy.
3. Give aboriginal peoples and other cultural groups a greater role in developing Saskatchewan's tourism potential.
4. Expand Saskatchewan's Provincial Park and Urban Park System to enhance tourism.
5. Develop and support the transportation system which is necessary to maintain or enhance tourism.
6. Improve Saskatchewan's highway system to include more and better rest areas, wildlife viewing areas and points of interest.



III. *Increase education and awareness to ensure that tourist operators and tourists understand their role in achieving a sustainable tourism industry.*

ACTION:

1. Develop public awareness programs to make tourists sensitive to the effects of their actions.
2. Develop training programs for employees to foster sustainable tourism.



NON-RENEWABLE RESOURCES

OBJECTIVE IV

USE NON-RENEWABLE RESOURCES WISELY

Using minerals from the ground involves many activities, such as exploration, development, mining, processing, reclamation and decommissioning mine sites. The province owns most non-renewable resources and issues mining leases.

Products of the mining industry are necessary for households, construction, transportation, power and communication systems. The concept of sustainable development applies to non-renewable resources in a different way than it does to renewable resources. The mining of any given ore body is not sustainable, but the mining industry as a whole can continue over time. As mineral deposits are mined, new deposits are discovered while new technologies and products reduce the need for these minerals.

Potash and coal reserves are large but finite. We have about 4.4 billion tonnes of potash ore. We have an estimated 7.6 billion tonnes of coal; 1.7 billion tonnes can be recovered by strip mining and could last more than 120 years. Known uranium reserves should last at least 50 years at current production rates. Sodium sulphate and salt reserves are plentiful. Gravel is available but far from major markets.

Reserves of our mineral resources can be extended and adverse environmental effects can be limited by applying the Round Table's "Principles for Sustainable Development":

- Responsible mining cannot threaten the environment or renewable resources for future generations.
- Mineral wealth should be passed on from generation to generation. Exploration, recycling, new technology and product substitution should make up for used ore deposits.
- Environmental protection must accompany mining. All costs and benefits must be taken into account in development decisions.
- Mining affects local people; therefore, considering cultural and social effects is part of sustainable development.
- Efficient mining techniques save resources by reducing, reusing, recycling and recovering minerals whenever possible.
- A mine site must be restored as closely as possible to land conditions before development or to conditions of economic and environmental value.

The mining industry is an important source of materials, jobs, exports and revenue. In the past three years, the annual value of mineral sales has been \$1.5 billion. Potash and uranium are important exports, totalling almost 20 per cent of all provincial exports.

Mining and exploration employed about 5,500 people in 1991. The Saskatchewan Mining Association estimates that about 23,000 jobs come directly or indirectly from mining. In northern Saskatchewan, mining is the largest private employer. However, mining affects southern and northern Saskatchewan differently.



In the south, workers live next to mines or they commute short distances. Mining supports communities where mines are located and provides off-farm employment. In the north, mines are situated in remote areas. Employees typically fly to work and then back home on a regular work schedule.

Industry and government must make special efforts to consult intensively with residents in northern Saskatchewan to ensure that all projects are integrated into the region's culture, environment and economy. Northern residents express concern about possibly adverse environmental effects on hunting, trapping and fishing.

The wastes generated by mining can contaminate the air, soil and water in surrounding areas, damaging habitats and ecosystems. Mining companies must exercise great care in disposing of wastes. To ensure that wastes are properly managed, mining operations are subject to strict federal and provincial standards and regulations.

Mining has disturbed only 23,960 hectares (.04 per cent) of provincial land, but it leaves long term effects. Current potash operations use 3,000 hectares of land for storing waste salt. This waste salt can contaminate air, land and water. Strip mining for coal creates a short term disturbance, but access roads and cleared sites for northern mineral exploration scar the landscape for years. The steep walls and deep, flooded holes of unreclaimed sand and gravel pits can be dangerous.

Water near many mining operations is affected by liquid effluents. With some exceptions, effects on air quality are local – dust from road traffic, tailing piles, and

plant emissions. Standards ensure that effluent is not acutely toxic, although accidental spills may be toxic at the point of discharge. In northern Saskatchewan, stream crossings may block fish if the crossings are constructed improperly during exploration.

Radioactivity occurs in uranium mines. It is also present to a much lower extent in silver, gold and base metal mines. Radiation levels must be controlled to protect the health and safety of workers. Mining companies must continually employ methods and processes that maximize mineral recovery while minimizing waste and environmental effects.

Public Input

During the Round Table's public meetings, the following points were raised:

- Mining must be integrated not only into a region's economy, but also into its culture and environment.
- Each mining project must be assessed for its contribution to cumulative environmental and health effects.
- Mine sites must be restored as closely as possible to original conditions.
- There must be greater consultation with northerners, Metis and Indians before mining operations are developed.



RECOMMENDATIONS

I. *Integrate mining into a region's culture, environment and economy.*

ACTION:

1. Analyze each project individually for its compatibility with a region's culture, environment and economy, and for its contribution to the cumulative effects that mining has on the environment and on living and working conditions.
2. Improve co-operation among industry, government, and local communities through initiatives such as increased hiring and training of local residents, greater use of local services, the provision of scholarships, and establishment of mining sites as tourist destinations.

II. *Conserve mineral resources by ensuring that mineral deposits are mined and used in environmentally and economically acceptable ways.*

ACTION:

1. Industry, government and the public should emphasize the recovery, reuse and recycling of minerals, metals and their products.
2. Reduce demands for non-renewable resources through public education and information programs.
3. Government, industry and the public should pursue policies that encourage the use of substitute materials to conserve more valuable resources.

4. Industry and government should support research and development of technologies that increase recovery rates of mineral resources.

5. Ensure that environmental costs, including compensation and mitigation, are included in pricing of mineral products.

III. *Develop regulations, guidelines and a code of practice for mineral exploration.*

ACTION:

1. Provide stakeholders with sufficient notice before granting exploration permits and promptly advise them of any changes made in the permits.

IV. *Strengthen reclamation and decommissioning requirements when evaluating new and expanded mining projects.*

ACTION:

1. The government should develop area-specific reclamation guidelines and certification criteria for the abandonment of reclaimed land.
2. Require mining companies to demonstrate that necessary decommissioning and reclamation plans can be carried out, before granting approval to proceed.
3. The government should consider accepting a shared responsibility with industry in meeting the cost of required, new decommissioning and reclamation measures that are in addition to ones already in place and approved.



V. *Conduct further research and development into improved mining practices.*

ACTION:

1. Industry, government, and educational and research institutions should cooperate in researching the following:
 - environmental research to support regulations
 - waste disposal technology
 - improved mining techniques
 - acceptable and effective reclamation techniques
 - monitoring of post-abandonment mine tailings and drainage
 - resource assessments
 - product diversification
 - socio-economic assessment, monitoring and documentation
 - establishment of mining towns rather than commuting labor forces



ENERGY

OBJECTIVE V

MAXIMIZE ENERGY EFFICIENCY

Energy is important to Saskatchewan's economic activities, but the oil, natural gas and coal which are often used to generate energy are finite. The energy sector can be subdivided into energy production and energy use. However, production is largely export-oriented and not driven by Saskatchewan energy needs.

Saskatchewan extracts and consumes crude oil, natural gas, coal, hydro-electricity, and some ethanol. We extract uranium but we export it. Our non-renewable energy reserves are difficult to estimate because we are uncertain of the size of coal, oil, gas and uranium resources.

Oil and gas production is one of Saskatchewan's largest industries. Over the five-year period from 1987-1991, the industry provided employment (about 5,000 "person years"), spent \$430 million and paid \$290 million in royalties annually. These figures understate the significance of the industry because they do not include spinoffs. The viability of the oil and gas sector is important for the long term prosperity of the province.

Over the same period, the electrical generating sector's capital expenditures averaged \$237 million and provided employment of 2,400 person years.

Pumping any one oil or gas well is unsustainable. However, the oil and gas industry can extend its viability by using the best available technology to maximize recovery rates.

The following two tables show the distribution of energy consumption by sector and by fuel type:

Distribution of Energy Consumption by Sector, Saskatchewan, 1989

Per Cent

Residential	30.7
Commercial	14.6
Industrial	24.9
Transportation	29.8

Saskatchewan Energy Use by Fuel Type, 1989

Per Cent

Natural Gas	33.7
Oil	32.1
Coal	30.4
Hydroelectricity	2.4
Other	2.0

Note: Farm energy consumption is included in residential use and transportation.

(Information provided by the National Energy Board)

On a per capita basis, our energy use is among the highest in the world. We heat our homes for many months of the year, but we also use much energy in heavy industry and long distance travel. We can do more to increase efficiency and conservation, sharpening our competitive edge and diminishing the environmental effects of energy use. Because the National Energy Board forecasts a 0.46 per cent annual increase in total energy demand between 1989 and the year 2000, we must decide how to control and meet our needs.



Saskatchewan has large, undeveloped reserves of oil, natural gas, coal and uranium. We also have renewable sources of energy – solar, wind, hydro and biomass (wood chips, straw or sawdust) – although few of these are now being harnessed. All options must be evaluated for their suitability to meet long term energy needs.

The questions confronting the people of Saskatchewan are:

- How can we best manage our energy demands?
- What energy resources should we develop to meet our needs?
- In what order should we develop these resources?
- How can we best minimize the impact of energy development on the environment?

Our first step is to develop an energy policy that would lead to a sustainable energy path for Saskatchewan. We need to recognize the vital issues of energy conservation and efficiency in all sectors, as well as environmental impact, energy prices, alternative energy sources, transportation, energy exports and planning.

ENERGY CONSERVATION AND EFFICIENCY

Energy conservation and efficiency are necessary to achieve sustainability. They are the most effective and affordable means of controlling the environmental effects of energy supply and use, and they form the foundation of a sustainable energy strategy.

Energy conservation and efficiency programs alone may not meet the province's projected energy requirements. In the short term, any needs over and above the

energy saved by these measures will probably come from fossil fuel.

ENVIRONMENTAL IMPACT

Global warming and destruction of the ozone layer, are perceived as the world's most serious environmental problems. The use of fossil fuels, such as petroleum, natural gas and coal, is believed to be a primary cause of global warming.

Saskatchewan contributes about 0.15 per cent of the Earth's "greenhouse gases." While this is a relatively small amount, our moral obligation and our own self interest tell us to minimize our contribution to these harmful emissions through energy conservation and efficiency programs, use of non-fossil fuels, improved scientific understanding of the issues, and development of other solutions, such as additional carbon sinks.

ENERGY PRICING

Energy prices determine the quantities and types of energy that are produced and consumed. Most energy prices, except for electricity, are set by international market prices. Governments influence prices marginally through taxes, subsidies and royalties.

Today's energy prices only partially cover the costs of producing, supplying and using energy under current environmental regulations. These prices do not include the full environmental costs, tangible and intangible – the effects on air, land and water – or the social and aesthetic costs.



When prices do not reflect true costs, there is little economic incentive to conserve energy. Society will not invest fully in efficient plants and equipment. Households will not buy efficient appliances, and builders will not construct homes that are better insulated. Many factors, such as the competitiveness of our industry with other jurisdictions, must be examined.

ALTERNATIVE ENERGY SOURCES

In the future, we will be able to harness energy sources that are cleaner than fossil fuels. Biomass, hydrogen fuel cells, wind and solar power will generate sustainable energy. Compressed natural gas, propane and other alternative fuels offer environmental advantages "at the tailpipe."

Alternative energy technologies require additional industry and government support through research, development, and fiscal incentives to compete with fossil fuels. As an example of progress in research and development, solar cells are expected to be cost competitive in the United States by the late 1990s. Co-generation is available now as an alternative energy source. For example, about 27 per cent of Denmark's electrical capacity comes from co-generation. Co-generation is efficient because it provides both industrial process heat and electricity.

TRANSPORTATION

Transportation depends heavily on non-renewable resources. More than half of all the crude oil used in Canada goes into cars and trucks as gasoline or diesel fuel.

Our economy depends on the transportation sector. Trucks transport many

Saskatchewan commodities, hauling more and more bulk freight as the rail system closes branch lines. But fuel is often consumed by trucks leaving the province empty and by trains arriving empty. Trucking and rail systems could be more effectively coordinated. We should take advantage of rail's greater energy efficiency because trains are almost three times more fuel efficient than trucks per tonne-kilometre.

ENERGY EXPORTS

Much of Saskatchewan's domestic energy production is exported:

- 95 per cent of crude oil
- 20 per cent of lignite
- 40 per cent of natural gas
- 100 per cent of uranium

In 1990, Saskatchewan exported \$1.4 billion worth of crude oil and imported \$177 million worth. Benefits from export revenues and economic activity must be weighed against resource depletion and environmental effects. Export policies and decisions should take into account the security of future oil and gas supplies. They must also have broadly based public understanding and support.

ENERGY PLANNING

Only comprehensive planning, based on full public participation, will effectively address questions about sustainability and Saskatchewan's energy path — what, when and how our energy sources should be developed.



Several planning tools are available. One is Least-Cost Planning, providing energy services at the lowest economic and environmental cost. We must use the lowest cost resources before exploiting other energy supplies. Conservation is often the most cost effective way to meet increasing energy demands.

A Least-Cost Plan identifies high and low forecasts of energy demands. It compares those needs to supply options, such as efficiency measures, renewable sources or energy purchases. Saving energy should be our priority if it costs less than supplying new energy. Least-Cost Planning is an effective planning tool, particularly for electricity. The future of electrical energy in Saskatchewan has been addressed in the recent report of the Electric Energy Options Panel.

Public Input

The Round Table's public meetings found:

- General agreement that energy conservation and efficiency measures are most important in improving sustainability.
- Consensus on the need for conservation but not on the need for nuclear energy. There was no middle ground between pro-nuclear and anti-nuclear advocates.

The mandate of the Round Table did not include the resolution of the nuclear debate. The Round Table suggests evaluating uranium with other energy sources. The government established the Saskatchewan Energy Conservation and Development Institute to address this issue.

The following recommendations outline the action needed to set Saskatchewan on the path to a sustainable energy future.

RECOMMENDATIONS

- I. ***Industry, government and the public must develop a sustainable energy strategy for Saskatchewan.***

ACTION:

Energy Conservation and Efficiency

1. The Saskatchewan Energy Conservation and Development Institute, in conjunction with the two universities, Saskatchewan Research Council and other stakeholders, should immediately conduct a study of the achievable conservation and energy efficiency potential.
2. Revise building codes and urban design practices to reduce energy consumption.
3. Promote economically viable redevelopment and retrofitting of buildings to meet specified energy performance standards.
4. Public and private sectors should work toward establishing national standards for high efficiency lighting, electrical motors, appliances and equipment.
5. Emphasize the importance of reducing, reusing and recycling materials in energy conservation programs.
6. Provide up-to-date information for industry and consumers about energy efficient products and conservation techniques.
7. Establish a target for increasing the energy efficiency of all government buildings, and complete the work by 1995.



8. Structure electricity rates to encourage efficiency by including incentives to shift consumption from peak to off-peak hours.

Environmental Impact

9. Immediately begin developing and implementing energy policies which are economically and environmentally justifiable on their own merits, and act to reduce greenhouse gas emissions.
10. Cooperate with other jurisdictions to meet national and international air emissions goals.

Energy Pricing

11. The Saskatchewan Energy Conservation and Development Institute, in conjunction with the two universities, Saskatchewan Research Council and other stakeholders, should conduct a study to determine the extent to which environmental costs are included for each energy form.
12. Government should take steps to incorporate identifiable environmental costs, tangible and intangible, into energy planning and market prices for energy.

Harnessing Alternative Energy

13. Develop Saskatchewan's alternative energy sources and technologies, based on their sustainability and effects on primary resources and biological diversity.
14. Encourage the use of co-generation when economically feasible in

industrial, commercial and individual private operations.

15. Sask Power should buy energy for the provincial power grid from co-generation facilities and small scale power producers on the basis of the utility's avoided costs.
16. Develop incentives to encourage government agencies, municipalities, and industry to convert their vehicle fleets to more efficient and environmentally friendly fuels.

Transportation

17. Implement incentives to promote greater use of walking, cycling, public transit and car pooling.
18. Implement incentives to encourage the use of fuel efficient vehicles.
19. Explore measures to improve fuel and economic efficiencies of trucking and rail transportation.

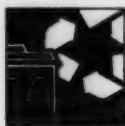
Energy Planning

20. Through public consultation before a project proceeds, evaluate each energy project individually for its compatibility with a region's culture, environment and economy, and for its contribution to cumulative environmental effects.
21. The Saskatchewan Energy Conservation and Development Institute, in conjunction with the two universities, Saskatchewan Research Council and other stakeholders, should conduct a study of Least-Cost Planning and its application in Saskatchewan.



22. Give priority to the following areas of research:

- energy efficiency and conservation measures
- forecasting energy supply and demand
- new technologies, such as horizontal wells and enhanced oil recovery techniques
- development of renewable energy forms



WASTE MINIMIZATION

OBJECTIVE VI

MANAGE AND MINIMIZE WASTES

Today's industrial economies use vast quantities of materials. Mining, forestry, agriculture and manufacturing generate wastes that can damage the environment. In the past, we have relied on technology to treat and dispose of wastes. Now we must take preventive measures to reduce waste.

SASKATCHEWAN WASTE STREAMS

Each day, Saskatchewan generates tens of thousands of tons of waste in households, businesses, governments, hospitals, schools and other organizations. These wastes fall into six categories or "waste streams":

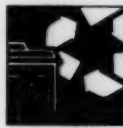
1. Solid non-hazardous wastes, such as packaging, yard waste and newspapers
2. Liquid non-hazardous waste, such as sewage and cooling waters
3. Waste dangerous goods, such as motor oil and dry-cleaning solvents
4. Biomedical waste from hospitals, labs, and veterinary clinics
5. Air emissions from transportation, energy production, or heating homes
6. Waste produced in mining, agriculture and forestry

In each category, waste can be minimized only to the degree that the 4Rs are applied: reduce, reuse, recycle and re-

cover. Right now the 4Rs are applied to municipal solid waste, but only limited attention has been given to the other five categories.

Each of the six "streams" poses both environmental and economic challenges:

- More than 70 per cent of Saskatchewan's landfills will be full in five years. Replacing landfills is both difficult and costly.
- Treated sewage and agricultural wastes which now end up in rivers could be used in irrigation or in the creation of wetland habitats, and processed sludge could be used for fertilizer if the sludge and waste sewage meet provincial standards.
- Waste dangerous goods are often improperly disposed of because there are few environmentally acceptable means of disposal.
- Disposal of biomedical wastes in Saskatchewan's incinerators does not meet new air quality standards.
- Maintaining good air quality means immediately reducing the levels of greenhouse gases, sulphur dioxide, nitrogen oxides, and volatile organic compounds (VOCs).
- The potash industry deposits about 20 million tonnes of salt on Saskatchewan land every year. Mining and processing minerals require methods of recovering minerals which reduce waste and minimize effects on the environment.



COMPONENTS OF A WASTE MINIMIZATION STRATEGY

An effective strategy for minimizing waste must first set goals and targets.

Goals should be set to:

1. Minimize the resources used and the waste generated in the manufacture of products.
2. Improve understanding about the need to minimize waste and the potential to reuse and recycle materials.
3. Maximize the reuse of goods and materials.
4. Promote the development of recycling and waste management industries.
5. Encourage markets for reusable and recycled products.

Secondly, a waste management hierarchy should be adopted, making disposal the last resort. Waste minimization focuses on the 4Rs in this order: **reduce, reuse, recycle and recover.**

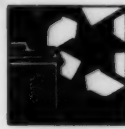
1. Reduce: decrease the quantity of waste and reduce its toxicity
2. Reuse: use products as many times as possible in their original form
3. Recycle: transform waste into new products
4. Recover: use materials or parts for new purposes (for example, composting to supplement soil nutrients, or burning biomass, such as wood chips, straw or sawdust, in place of petroleum, natural gas, coal or other fossil fuels).

To support and reinforce these efforts the province needs:

- Education and information programs to raise awareness and provide knowledge about how to minimize wastes.
- Province-wide collection systems for hazardous and recyclable materials.
- Research and development to promote change and innovation.
- Control and monitoring to measure progress toward targets and encourage government agencies, citizens, industry and business to be accountable and to comply with legislation and standards.
- Monetary or non-monetary incentives to encourage waste minimization practices or to finance waste minimization programs.

Funding for waste minimization could be built into the cost of a product at several stages. Lifecycle costing (LCC) recognizes the costs at all stages of a product's life-cycle from mining materials to processing, manufacturing and distributing the product and disposing of residual waste. LCC means providing energy services at the lowest economic and environmental cost. Prices that account for the real cost of using materials are the most effective incentives for reducing, reusing, recycling and recovering.

All people must accept responsibility for properly managing their own waste and for achieving minimization goals. Responsibility constitutes the fifth "R" in an effective waste minimization strategy.



Finally, waste minimization can actually encourage new business opportunities. For example, recycling can create new industries and jobs, especially in the collection and processing of recyclable materials. The demand for these materials grows as people buy recycled products. The province could revise or re-design business and market development programs to stimulate environmental industries and markets for recycled products.

A waste minimization strategy will not only cut waste, but also make the economy flexible, diverse, self-reliant and sustainable. In the long run, using materials efficiently reduces waste and decreases the need for materials and energy. Reduced energy production will help slow global warming. At the same time, efficiency makes an economy more competitive.

Public Input

During public meetings and conferences for youth and stakeholders, the most frequently discussed topic was waste management. People pointed out that:

- There is a great deal of official encouragement for recycling, but governments are not yet providing any money to support it.
- The province needs more collection depots and processing centres for recyclable and hazardous materials.
- Recycled products have a limited market or no market at all.
- We should increase deposits for recyclable goods, and the cost of recycling should be built into the prices of products.

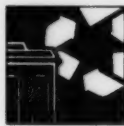
A waste minimization strategy will address these issues and concerns. The following recommendations outline the goals of a waste minimization strategy.

RECOMMENDATIONS

I. *Encourage individuals, businesses, governments and others to minimize waste.*

ACTION:

1. The Saskatchewan Government, in cooperation with stakeholders and the general public, should develop a comprehensive waste minimization strategy.
2. Develop education and information programs to raise personal awareness and knowledge about how to minimize waste.
3. Provide incentives, monetary and non-monetary, to encourage waste minimization practices and programs.
4. Increase deposits for recyclable products and include the cost of recycling in the price of products.
5. Impose and enforce controls and standards when education and incentives fail to curb undesirable activities and products. (For example, create standard sizes for containers, and set limits on vehicle exhaust emissions).
6. Penalize those whose waste management practices fail to comply with controls and standards.



7. Participate in organizations like the Saskatchewan Waste Reduction Council to minimize waste.

II. *Government and industry need to expand the provincial waste management infrastructure to include at least the following components.*

ACTION:

1. Expand the province-wide SARCAN collection network to collect a broad range of recyclable materials (for example, waste oil and car batteries).
2. Establish workable systems for handling, treating and disposing of waste dangerous goods.
3. Develop cooperative systems with neighboring provinces and states whenever such systems can increase efficiency or effectiveness.

III. *Government must help minimize waste by developing and implementing policies and administrative systems.*

ACTION:

1. Continue developing and pass a Waste Minimization Act by 1994.

2. Saskatchewan should adopt a target to minimize waste by 25 per cent before 1996 and by 50 per cent before the year 2000.

3. Implement environmentally sensitive purchasing policies. (For example, minimize use of toxic raw materials, reject excessive packaging, and avoid single-use disposable items).

4. Implement policies and programs that develop waste minimization industries and markets for recyclable materials.

5. Develop local, provincial, national and international costing and pricing systems that include the environmental as well as the financial costs of resource extraction, manufacturing, use, disposal and clean-up.

6. Create reporting systems that measure progress toward waste minimization targets and ensure all producers of waste are accountable.

7. Develop incentives to encourage manufacturers to put stickers on their products to provide life cycle costs and recycling information.

8. Fund research for new ways of minimizing Saskatchewan waste.



SUSTAINABLE SOCIETY

OBJECTIVE VII

ENSURE SOCIAL SUSTAINABILITY

Saskatchewan people can trace their roots to every corner of the globe. Our province is a rich mosaic of cultures, values and ideas. For centuries, the province was the homeland of aboriginal peoples who lived in harmony with the natural environment. Less than 200 years ago, Europeans arrived with their political, legal and economic systems. Since then, Saskatchewan's population has grown to almost one million.

Diversity creates contrasting views about how our society should evolve. Perspectives and values may vary among aboriginals and non-aboriginals, rural and urban dwellers, developers and environmentalists, consumers and conservers. When views are polarized decision making is difficult.

Social diversity requires ways of making decisions that bring people together to stress similarities, resolve differences, and move us toward a sustainable society.

We can sustain our environment, economy and society only if we change our values, lifestyles and goals. We must emphasize our quality of life rather than our standard of living. One incentive to change our habits is the prospect that a "green lifestyle" is more enjoyable than the "rat race" of a consumer lifestyle.

Green living is less expensive than present consumer lifestyles. It leaves more time for children, companions and nature, and it restores contact with neighbors, local producers and merchants. Studies show that the green lifestyles of conservers keep more money and jobs in local economies, and lighten the burden people place on the environment.

Education and information can help change lifestyles and values, but the effectiveness of education will be limited without changes in prices and tax structures to reduce and redirect the demand for material goods and services. The section on Tools for Sustainable Development deals with the kinds of changes required.

Indians, Metis and northerners point out that they are not consulted in decisions which affect their environment and livelihood. The Round Table believes that the time has come for governments and industry to share responsibility for the environment and resources with Indians, Metis and northerners, whether or not aboriginal self-government rises out of current constitutional talks. The Round Table process has proven its merit and the process should be extended to form regional Round Tables, especially in the north.

SOME FEATURES OF A SUSTAINABLE SOCIETY ARE:

- It fulfils real needs rather than wants.
- It has an open, accessible political process that puts government decision-making power closest to the people who are affected by a decision.
- It increases public involvement in developing, interpreting and implementing concepts of sustainability.
- Political decision making incorporates environmental concerns directly and extensively in improved environmental assessment, an environmental Bill of Rights and other mechanisms.



- Environmental management is linked directly to social, cultural, economic and political activities by allocating power to regional or transboundary jurisdictions, and by promoting greater local and regional self-reliance.
- Social, cultural, political and economic equity is characterized by understanding and tolerance for other points of view, cultural backgrounds and needs.
- Development improves the quality of life but consumes fewer resources.

Public Input

The public made these comments:

- Involve Indians, Metis, and northerners directly in managing and protecting heritage resources. Metis, Indian and youth representatives stressed the need to be full stakeholders.
- Bring together traditional and modern technological perspectives to protect the environment and manage natural resources.
- Protect more heritage resources of high quality.
- Emphasize lifestyle changes that increase our quality of life rather than our standard of living.

RECOMMENDATIONS

I. *Government must develop and strengthen ways to empower people in decision making.*

ACTION:

1. In environment-economy decision making, use consensus-based approaches in which decision makers are aware of all issues, and in which communication between stakeholders is balanced and founded on trust.
2. Extend the Round Table process to the regional level.
3. Involve and consult northerners, Indians, Metis and youth.
4. Adopt decentralized methods of governing when feasible. (For example, increase local autonomy and work with regional planning councils). Global considerations must be part of local decision making.
5. Develop partnerships among various sectors and interest groups to improve opportunities for economic development, resource conservation and problem solving.

II. *Government and community groups must promote community self-reliance, interdependence and environmentally friendly ways of living.*

ACTION:

1. Support and encourage activities, services and organizations that involve people directly in meeting their local or regional needs.



2. Maximize the participation of volunteers in designing, implementing and monitoring sustainable development plans, programs and policies.
3. Encourage community partnerships to meet joint needs (for example, regional community development corporations).
4. Promote sustainable communities and encourage development that contributes to maintaining or improving the quality of urban life.

III. *Government must promote and encourage life-enriching pursuits.*

ACTION:

1. Review and revise market interventions and tax structures to encourage changes in consumption patterns.
2. Design information and education programs aimed at changing people's lifestyles from consumer lifestyles to consumer or "green" lifestyles.
3. Give priority to supporting and developing artistic, aesthetic, educational and recreational pursuits, which do not rely heavily on consuming materials and energy.
4. Measure quality of life rather than standard of living and incorporate quality of life considerations into decision making processes.

IV. *Government must protect and conserve cultural and heritage resources.*

ACTION:

1. Maintain functional systems for protecting and allowing access to heritage resources, including legal protection, site markers, museums, archives and interpretive programs.
2. Initiate Indian and Metis co-management in managing and protecting native heritage resources.
3. Protect heritage lands of high quality.
4. Implement research programs to establish an inventory and an evaluation of heritage and cultural resources.

V. *Government and community groups must foster opportunities for cultural diversity within the context of cooperation as global citizens.*

ACTION:

1. Develop cross-cultural programs for presentation to schools, community groups, churches and service organizations, explaining the beliefs and values of Saskatchewan's many ethnic groups.

*Tools
For
Sustainable
Development*

TOOLS FOR SUSTAINABLE DEVELOPMENT

The Conservation Strategy prescribes 64 recommendations and 203 actions that will move Saskatchewan toward a sustainable future. Successful implementation of the Strategy depends on full and equal partnership among government, business, interest groups and individuals in making resource development decisions. It depends on having adequate and integrated information, investing research funding in the wisest ways, having an education plan to support sustainable development, and taking advantage of business opportunities. Some group must oversee our progress.

RECOMMENDATION

The government must designate an independent body to monitor and report on progress in implementing the Conservation Strategy.

The following list of tools with their brief description is not exhaustive, but rather indicative of the most critical mechanisms available to advance sustainable development in Saskatchewan.

INTEGRATED RESOURCE MANAGEMENT AND LAND USE PLANNING

Several recommendations in the draft Conservation Strategy call for greater integrated management of resources.

Integrated management is necessary because of the links within and between environmental and economic systems. Integrated management is a means of achieving the efficient use of resources without harming any parts of the environment or economy.

While integrated management is widely recognized as essential, establishing integrated management and planning mechanisms is a difficult task. Integrated management involves policy formation, integrated planning and action.

We need an integrated policy to set environmental, economic and social objectives. The objectives must be broad enough to allow for flexibility or change.

They should provide a framework for individual or social achievement, and they should identify goals for developing and using resources.

Saskatchewan's Conservation Strategy provides this framework. It recognizes that development is necessary to meet personal and social needs. The strategy also gives direction for development that does not damage our primary resources of air, water and land. It states that all of Saskatchewan's biological diversity must be protected, and that renewable resources need to be managed in sustainable ways. In the case of nonrenewable resources, the strategy states that we must not waste resources, but rather minimize rates of depletion.

Armed with a policy document that encourages integrated management, the next challenge is to break down individual, social and institutional barriers.

The greatest barriers are current arrangements for managing our resources. Water and land resources, for example, are managed by completely separate provincial agencies. To complicate the matter, some resources are also managed by both federal and provincial agencies. In municipalities, responsibility extends to local governments. The solution is not to create one large resource management department, but to coordinate agencies and objectives for shared resources.

Conflicting interests can be reconciled by adopting comprehensive land use plans. Land use planning identifies issues and establishes provincial objectives. In conjunction with integrated resource management, this kind of planning is an essential tool for sustainable development.

Land use planning is challenging, especially in the settled south. Planning often occurs at the municipal level in cooperation with provincial agencies and within political rather than ecological boundaries. But only comprehensive, ecological planning for a given area can achieve sustainable development and provide direction for municipalities.

For example, in the recent Great Sand Hills Land Use Strategy, political boundaries were no barriers to an ecological approach. The strategy was developed for an area representing three municipalities. To apply the strategy, the municipalities formed a planning district encompassing the Great Sand Hills.

Unlike the province's southern half, the north covers sparsely populated Crown land. Saskatchewan Parks and Renewable Resources manages resources in the north.

Crown land ownership and a dominant agency simplify integrated resource management, but there are no biophysical inventories and limited financial and human resources.

Forest Management License Agreements are now used to manage the commercial forest zone. If these agreements were prepared with the advice of all relevant forest users, they could serve as integrated management plans. In the non-commercial forest zones, integrated plans should be the responsibility of the provincial government.

Saskatchewan's river basins also need integrated management. The Qu'Appelle Basin Study of the 1970s is an excellent model. The Qu'Appelle basin and its ten major tributaries cover about 51,000 square kilometres. The study examined water quality and quantity, land and water use and flooding, employing public consultation and reliable, current data. The recently completed South Saskatchewan River Basin Study is another model of planning for multiple interests.

Integrated management and land use planning initiatives have been used successfully in Saskatchewan to manage resources for multiple objectives. These examples should form the basis for better integrated management and the adoption of land use plans in the future.

These tools require commitment and resources from all levels of government. The Conservation Strategy provides the framework and the momentum to achieve the necessary integrated management and land use planning for sustainable development.

MONITORING AND INFORMATION MANAGEMENT

MONITORING

Environmental monitoring is the collection of data as part of day-to-day activities in government and business, scientific and research communities. This information has many purposes: to understand how resources are interrelated, to evaluate the effects of development, and to protect biological diversity.

The Conservation Strategy gives direction for protecting and managing our resources, but adequate information is not always available. Data collected by government, researchers and scientists are often not broad enough for assessing sustainability. Some data bases are outdated. We need to improve environmental monitoring to gauge the province's progress toward sustainable development.

The sustainable use of resources requires knowledge to measure all aspects of use and development. Sustainability indicators are probably more manageable than complete data bases.

In addition to suggesting trends in resource use, indicators could help assess the impact of policies and programs on sustainable development. Indicators showing when resources are being depleted faster than they can be replenished would signal the need to evaluate policies and programs in a given area.

INFORMATION MANAGEMENT

The Conservation Strategy recommends integrated planning for sustainable development. This requires developing and maintaining many data bases that can be linked to each other. Two major information management initiatives are currently underway in Saskatchewan — the Geographic Information System Data Base

Management Model and the Saskatchewan Conservation Data Centre.

Geographic Information Systems (G.I.S.) are software systems that manage geographical information, such as vegetation and the location of features, such as roads and rivers. G.I.S. can help managers and planners analyze comprehensive sets of data.

The Central Survey and Mapping Agency (CSMA) is the provincial government department responsible for developing standards to make G.I.S. effective in Saskatchewan. The department creates electronic base maps which will be available for reference and integration of environmental and economic information. A provincial data model, data directory and data interchange are also being developed. The provincial Land Users Information Committee is cooperating with CSMA to coordinate the development of data transmission standards.

To further develop G.I.S. the Saskatchewan Conservation Data Centre has recently been established. The centre will be a repository of endangered species and ecosystem information which can easily be combined with other G.I.S. information. A company planning a pipeline, for example, could quickly identify critical features, such as the nesting locations of endangered burrowing owls, archaeological sites or fish spawning grounds before determining routes and construction schedules.

Data from federal, provincial and municipal agencies should be integrated with data collected by industry, developers and environmental consultants.

G.I.S. is a powerful tool for integrated planning, policy making, strategic planning, resource management, development planning and administration.

ENVIRONMENTAL ASSESSMENT

To make economic activities both environmentally and economically sustainable, we must improve environmental assessment. Detailed assessments of the environmental, economic and social effects of development proposals and major policies will require an open process.

The Saskatchewan Round Table sees the need to modify the current process for independence, breadth and depth of involvement, information availability, comprehensiveness, fairness and reliability.

INDEPENDENCE

The assessment process should be independent. Administrators are able to function best when they are free of biases or outside influences.

INVOLVEMENT

The Round Table has demonstrated the value of involving principal stakeholders or interested parties in economic and environmental decisions that affect them. Stakeholders include those with differing interests, not just those with similar interests, and they need to talk face to face, not just supply information. Only decisions made openly and in consensus are most often sustainable.

INFORMATION

Diverse interests can be resolved only in a spirit of trust and confidence in the process. Trust grows when adequate information is available and shared among stakeholders and the public.

COMPREHENSIVENESS

Assessments must be conducted on a basis that is broad enough to fully encompass the environmental, economic and social considerations of sustainable development. Assessments should be conducted on a "cradle-to-grave" basis for conception, planning, construction, operation and closing. They must also consider local, regional and global implications.

FAIRNESS AND RELIABILITY

The assessment process must be fair for all competing interests. Reliability means harmonizing the assessments of different governments.

POLICIES AND PROGRAMS

Occasionally, governments implement policies and programs to serve one interest at the expense of another. To ensure a sustainable future, all interests must be considered in policy and program solutions. Poor policies have led to practices that harm the environment. Policies and programs should be scrutinized according to the principles of sustainable development before implementation.

RECOMMENDATION

Modify and strengthen environmental assessment.

ACTION:

1. Create an independent assessment process.

2. Build the assessment process on a foundation of broad and in-depth public and stakeholder involvement.
3. Make available information about the assessment process and specific deliberations.
4. Make the assessment process comprehensive and timely.
5. Ensure that the assessment process is both fair and reliable for all participants and harmonize processes among governments.
6. Subject to scrutiny all policies and programs which affect the sustainable development of resources during their formulation.
7. Apply the Conservation Strategy's objectives and principles for sustainable development to all

RESEARCH

Research, both basic and applied, drives long term scientific, technological and economic advances. But research has dual implications for sustainable development. On one hand, the products of research and development have caused much of today's environmental damage and pollution. On the other hand, research can help remedy the damage or even prevent it.

Priorities for sustainable development research must be set to maximize returns from scarce funding sources. Saskatchewan should channel research funds into areas with the greatest effect on the province's future economic and environmental sustainability, particularly relevant projects not being researched in other jurisdictions.

Of all economic activities, agriculture continues to have the greatest effect on Saskatchewan soil, water and wildlife. Traditional agricultural production is under economic and environmental pressure to undergo fundamental changes to sustain long term agriculture and food supplies.

Research in sustainable agriculture must address the following issues:

1. Soil degradation: the loss of fertility and organic matter, increasing salinity, wind and water erosion.
2. Water quantity, quality and pollution: the availability and suitability of a reliable water supply concerns farmers, rural communities and enterprises.
3. The effects of global warming on agriculture.
4. The increased use of genetic resources.
5. Competing land uses: flora and fauna habitats, the urban-rural interface, and alternative uses of agricultural lands.

In Saskatchewan, water resources are finite. Everyone is responsible for water use and water quality. We must learn to use water efficiently and to save surplus water for times of shortage.

The following research areas have been identified for sustainable water management:

1. Water conservation strategies.
2. Maintenance and enhancement of water quality.

CONSENSUS BUILDING

Across Canada and in Saskatchewan, conflicts escalate when more and more people want to use limited resources for a greater number of purposes. Conflicts challenge traditional decision making processes and many decisions are protested, appealed or ignored. Misgivings are growing about the ability of governments to adequately mediate between competing interests. Appeals, court cases and civil disobedience create costs, a psychological drain and often additional uncertainty.

Conflicts have grown not only because of increasing demands for resources, but also because of narrow approaches to decision making. We have hesitated to broaden involvement in the planning, construction or operation of major projects. Projects are often undertaken with the participation of only those with similar resource interests and conflicts are faced only when many options are already closed.

The Round Table process shows the value of a full and open declaration of diverse interests, early in the consultative process. The separation of needs from wants, willingness to acknowledge the needs of others and the development of trust where none existed before build consensus. Decisions by consensus usually inspire commitment, contributing to sustainable development.

Consensus differs from other ways of making decisions. Consensus is an agreement on a package of provisions that address an issue. Participants may not agree with all the elements but there is enough of what they need in the package to allow overall acceptance.

However, consensus is just one part of comprehensive decision making. Other means are needed when consensus is inappropriate, or when attempts to reach a consensus fail. These alternatives are called fallbacks.

Fallbacks are measures for reverting to a majority ruling or referring an issue to a higher authority. Fallbacks encourage consensus because participants usually prefer to arrive at a decision themselves instead of turning a matter over to some other party. Fallbacks must be clearly defined before a consensus process begins.

A consensus decision is time consuming, costly and sometimes frustrating. However, unilateral decisions that appear to be efficient often result in costly and lengthy appeals or court action.

Consensus building must be our first approach to decision making to make environmental and economic integration successful.

EDUCATION

A sustainable future in Saskatchewan must include a healthy environment, a healthy economy and healthy lifestyles. The future depends on the awareness and commitment to improve all three.

The Round Table recognized the need for an education plan to support sustainable development, and advisory committees from 11 economic sectors agreed. As a result, an Education Advisory Committee was formed in March 1991 and it made the following recommendations.

KEY RECOMMENDATIONS

1. Ensure that the body or group established to monitor and report on implementation of the Conservation Strategy also has the responsibility to monitor the implementation of the Education Strategy.
2. Inform senior educational, political, business and community leaders so that they can advance sustainable development education and encourage the commitment of others.
3. Establish a central and accessible database on sustainable development. Information must be Saskatchewan-based and continually updated.
4. Incorporate sustainable development concepts and values into curricula and programs in formal education systems and institutions in Saskatchewan.

SUPPORTING RECOMMENDATIONS

5. Incorporate sustainable development concepts into all existing curricula for Kindergarten to Grade 12 schools.
6. Encourage postsecondary institutions to:
 - offer education courses on sustainable development
 - conduct related research
 - offer professional education programs in environmental management and protection
7. Identify and practice ways of effectively promoting environmental education through in-service education and professional development for K-12 teachers.
8. Compile sustainable development resources which are pertinent to Canada and Saskatchewan for use in schools. The materials must be balanced, accurate and current.
9. Develop and maintain public education programs to support broad participation in sustainable development.
10. Make full use of existing information and organizations in the workplace, business, labor, communities and the professions which could provide educational programs on sustainable development.
11. Formally recognize agencies, communities and workplaces that undertake effective sustainable development education programs.

BUSINESS OPPORTUNITIES

Saskatchewan businesses are responding to environmental concerns. "Green" products are on store shelves, and businesses are participating in recycling and reuse initiatives. Many are increasingly willing to reduce their consumption of resources and to consult with individuals and interest groups when they make decisions.

Several factors explain this response. Business people, like consumers, are recognizing threats to our environment and sharing concerns for our planet's well-being. They see that they must be part of a sustainable society.

Businesses feel the public pressure for environmentally responsible behavior. The public now holds businesses accountable for any environmental consequences of business activity. Similarly, businesses respond to consumer preferences for environmentally friendly products.

Conservation of energy, water and other resources saves money for any business operation. Waste reduction decreases treatment or disposal costs. Some wastes can be recycled for products with considerable value in the marketplace.

The integration of the environment and economy offers Saskatchewan's business sector growth in the following areas:

- environmental expertise and advice
- pollution control and monitoring equipment
- information services
- energy and resource efficiency technologies
- recycling
- ground water treatment technology and equipment
- value-added processing

There are some economic activities that have relatively limited environmental impacts and which may provide business opportunities in the communication and information industries.

Saskatchewan's Conservation Strategy prescribes new ways of undertaking existing economic activities to make them sustainable. Making the most of environmentally friendly business opportunities is essential to continuing economic health.

REGULATION

Polluters should carry the costs of preventing or mitigating pollution. Until now, pollution has been tackled by "command and control." This approach may reassure politicians and the public because governments know what they are asking for, people know what they are supposed to get, and companies know what pollution control they must deliver.

Banning some products — PCBs, leaded gas, 2-4,5T, DDT and Dieldrin — is a "last resort" measure. Once a substance is banned, industries seek ecologically sound substances or alternative processes.

Regulation is not always the most effective or inexpensive means of controlling pollution. There is no incentive to reduce pollution below set limits and little innovation beyond stipulated technologies. Investment may be discouraged because regulations are often tougher for new players than for existing firms.

The Saskatchewan Round Table suggests two complementary approaches: Economic Tools and Regulation. Regulation could take a graduated approach to environmental protection, ranging from self-regulation to enforcement. Good regulations are based on sound knowledge.

Self-regulation is desirable when publicly or privately owned industries want to be good environmental citizens, keeping as clean and innovative as they can afford to be. Self-regulation must be supported by economic incentives.

At the other end of the scale is enforce-

ment, a tool of last resort. It is an essential tool when applied fairly and consistently. Enforcement is for the "bad apples in the barrel" and for developers whose good intent is not followed by commitment.

Graduated regulations involve all stakeholders, the industry and regulating government agencies. Industry will agree to self-regulation if it participates in setting targets. The public will accept self-regulation if public representatives are at the table when targets are set and if they have a say in whether targets are being met.

RECOMMENDATION

- I. ***The government must take a graduated regulatory approach to environmental protection.***

ACTION:

1. Review existing provincial, environmental legislation to assess its effectiveness for sustainable development as defined in the Conservation Strategy
2. Identify the need to change, add or delete legislation
3. Harmonize environmental and economic legislation and processes (federal, provincial, municipal and aboriginal).
4. Develop and maintain necessary partnerships to support this approach and to ensure broad participation at each step.

ECONOMIC TOOLS

Regulations govern behavior, but economic tools use monetary incentives and deterrents to persuade individuals and companies to change their behavior voluntarily. Together, regulation and economic tools prevent and control pollution.

Ideally, all production and products should be pollution free, and in the long run prevention is more economical than clean ups. But even the best available technology cannot eliminate pollution. Therefore, an array of tools is necessary to curb pollution as much as possible.

The tools below can be used to integrate Saskatchewan's environment, economy and society.

TRADEABLE PERMITS

Emission limits adhere to pollution controls. However, if the pollution which a firm discharges is under permissible limits, it can sell or trade the difference to another firm. The second firm then has the right to release more than its initial limit. Hazardous wastes cannot be subject to trade.

FEEES AND LEVIES

Fees and levies are the prices paid for pollution. Polluters have to pay for their claim on environmental services as part of their private sector, cost-benefit calculations. **Effluent fees and levies** are based on the quantity or quality of pollutants released into the environment. **User fees** pay for the costs of public treatment facilities. **Product levies** are based on the pollution a product may create. **Administrative fees and levies** pay for government services to register,

implement and enforce pollution control, whereas **tax differentiation** means better prices for environmentally friendly products.

Fees benefit the environment directly when they are high enough to change the behavior of polluters and consumers.

IMPACT WEIGHTING SYSTEM

One tool for decision making is a system of environmental scoring. Energy options are considered according to specified effects on air, water and land. For example, sulphur dioxide, carbon dioxide and airborne particles correspond to given scores under "air." A final analysis of the costs of alternate technologies gives the scores a dollar value (in cents/kwh), indicating the best option.

SUBSIDIES

Direct economic incentives or subsidies are used to achieve economic and social goals. The following examples of targeted subsidies support sustainability:

- exemptions from sales taxes for projects or products that contribute to the conservation of resources or energy
- exemptions from assessed property value for environmental improvements
- accelerated depreciation for pollution control equipment
- low interest loans for environmentally sound projects
- financial assistance for municipalities which reduce waste by 50 per cent by the year 2000.

SaskPower, for example, could consider paying a price premium for co-generation projects that benefit the environment. Subsidies can be conditional, depending on whether the recipient agrees to certain actions.

INTERNATIONAL STANDARDS

Saskatchewan should press the federal government to have sustainability standards built into international trade agreements, such as the General Agreement on Tariffs and Trade and the Canada-U.S. Free Trade Agreement. In particular, countries that capitalize on unsustainable activities should be subject to "dumping duties."

ENVIRONMENTAL ACCOUNTS SYSTEM

National accounts recognize the creation and loss of man-made capital – that is, the construction and demolition of buildings

and structures – but they ignore changes to the value of natural resources. Consequently, nations and companies can show high levels of income while depleting resources and degrading the environment, affecting future income. National accounts need to be revised to recognize natural resources as capital, and to measure changes in their quantities. The economic value of resources can be established, and decreases should be treated as debits while increases are credits.

OTHER TOOLS

Government and industry can create **Green Procurement Policies**, based on the 4Rs. The government can levy **Dedicated Green Taxes** and the revenue can be earmarked for specific environmental problems. **Green Bonds**, which are tax-exempt, as are RRSPs, could be issued to finance projects for environmental improvement.

Appendices

APPENDIX A

SASKATCHEWAN ROUND TABLE MEMBERS

Frank Arnie, Co-Chairperson

- past president of the Saskatchewan Wildlife Federation and former director of the Canadian Wildlife Federation

Jon Gillies, Co-Chairperson

- Agricultural Engineering professor at the University of Saskatchewan, chairperson of the Saskatoon Chamber of Commerce Water Resources Committee, past-president of the Canadian Water Resources Association, and editor of the *Canadian Water Resources Journal*.

Honourable Carol Carson

- Minister of Saskatchewan Environment and Public Safety, Community Services, and the Saskatchewan Transportation Corporation.

Doug Chekay

- provincial manager of Ducks Unlimited Canada, and vice chairperson of the Saskatchewan Wetland Conservation Corporation.

Chief Roland Crowe

- Chief of the Federation of Saskatchewan Indian Nations, and three times second vice-chief.

Bill Gaynor

- vice president and general manager of the Saskatchewan Division of Weyerhaeuser Canada Ltd., a Saskatchewan Chamber of Commerce director, and director of the Saskatchewan Chapter of the Canadian Council on Native Business.

Dr. David Henry

- professor of Environmental Design at the University of Calgary, past president of the Canadian Parks and Wilderness Society, and author of *Red Fox*.

Dr. Stuart Houston

- professor of Radiology with the University of Saskatchewan's Medical Imaging Department, and past president of the Saskatchewan Natural History Society.

Sister Phyllis Kapuscinski

- member of the Faculty of Education at the University of Regina, the National Science Teachers Association and the National Association for Research in Science Teaching.

Lindsay Milne

- representative of the Canadian Petroleum Association, senior vice-president of Bow Valley Industries, and past president of the Canadian Institute of Mining and Metallurgy.

Ken Naber

- farmer at Melfort and operator of Naber Seeds Ltd., Reeve of the R.M. of Star City, past president of the Saskatchewan Canola Growers Association, and past president of Focus on Inputs Association.

John Nightingale

- president of the Cigar Lake Mining Corporation, chairperson of the University of Saskatchewan Board of Governors, and chairperson of the Saskatchewan Mining Association Environmental Committee.

Bert Weichel

- environmental consultant and past president of the Saskatchewan Environmental Society.

PREVIOUS MEMBERS OF THE SASKATCHEWAN ROUND TABLE

Beverly Brennan, vice-president, Philom Bios

Joan Duncan, former Minister of Economic Development and Tourism

Bill Duke, farmer and representative of Western Canadian Wheat Growers

John Gerich, former Associate Minister of Economic Diversification and Trade

Grant Hodgins, former Minister of Environment and Public Safety

Darla Hunter, former lawyer with MacPherson, Leslie and Tyerman

Austin Jagoe, former United Church minister

Lorne Kopelchuk, former Minister of Saskatchewan Parks and Renewable Resources

Beattie Martin, former Minister of Saskatchewan Environment and Public Safety

Colin Maxwell, former Minister of Parks, Recreation and Culture

Ray Meiklejohn, former Minister of Saskatchewan Education

Herb Swan, former Minister of Environment and Public Safety

APPENDIX B

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Dave Stuart
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James Yuel
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Round Table Youth Committee

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Naomi Beingessner
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Gordon Bergey
Regina, Saskatchewan

Avery-Dawn Bernett
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Todd Han
Saskatoon, Saskatchewan

Geoffery Hansen
Regina, Saskatchewan

Erica Jennings
Regina, Saskatchewan

Garry Kormos
Regina, Saskatchewan

Tonya Lambert
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Natasha Lynn
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Bertha MacDonald
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Jonathan MacDonald
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Chris Semenchuck
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Bonnie Tudor
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APPENDIX C

STAFF

Sheldon McLeod, Executive Secretary,
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Jon Orn Jonsson, Senior Economist,
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Janet Peters, Communications
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Brenda Beckman-Long, Editor, Round
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APPENDIX D

GLOSSARY

Abandonment of Reclaimed Lands: the departure of a development company which has completed reclamation of disturbed lands and returns ownership and responsibility for the land to others.

Acid Rain: sulphur dioxide and nitrogen oxides, mixed with water vapor in clouds and returned to Earth in acidic forms of rain, snow, dew or fog.

Aquifers: porous and water-bearing formations of underground rock.

Biological Diversity: the wealth of life forms found on the Earth, including millions of different plants, animals and micro-organisms, the genes they contain and the intricate ecosystems they form.

Biophysical Area: all living organisms and landscape features that are present in an area.

Carbon Dioxide: CO₂, a gas resulting from the burning of organic materials.

Carbon Sink: any method of carbon fixation for the long term storage of carbon dioxide.

Carrying Capacity: the maximum sustainable harvest rate of a renewable resource (for example, the maximum number of fish that can be caught in one lake, year after year: harvesting above the carrying capacity ultimately decreases the total number of fish available).

Chlorofluorocarbons (CFCs) and Halons: man-made chemical compounds or gases which undergo change in the upper atmosphere, destroying atmospheric ozone.

Clearcutting: removing all or most of the trees from a given area in a single cutting.

Co-generation: the integration of heat recovery with fuel-burning energy generating systems that produce electricity.

Compost: a natural, soil enriching substance of decomposing layers of carbohydrate-rich plant wastes (such as cuttings and leaves), animal manure and top soil.

Conservation: the wise use of natural resources to provide sustainable benefits.

Conservation Strategy: a plan that gives direction for using Saskatchewan's resources to achieve sustainable development.

Contaminant: see **pollutant**.

Crop Rotation: changing the types of crops planted in fields from year to year.

Cross Compliance: the establishment of management plans in exchange for the ability to participate in government programs.

Crown Land: land that is owned by the federal or provincial government.

Crude Oil: a viscous (goosey) liquid, consisting mostly of hydrocarbon compounds and small amounts of compounds containing oxygen, sulphur and nitrogen, including heavy metals.

Decommissioning: putting an operation, usually a mine, out of service with any required clean up or restoration.

Ecological Forest Management: managing the forest in a manner such that the forest can sustain itself over time without loss of production or biological diversity.

Ecological Management: an approach that attempts to manage resources

while respecting the laws of nature. If ecologically managed, renewable resources will sustain themselves over time.

Ecological Regions: an area of the Earth's surface, characterized by distinctive ecological responses to climate as expressed by vegetation, soils, fauna and aquatic systems. For example, the dry conditions of southern Saskatchewan have produced a grasslands ecoregion, an area that is characterized by plants which require little water.

Economy: a system of managing production, distribution and consumption of goods and services.

Ecosystems: subdivisions of the environment, consisting of communities of plants, animals and micro-organisms, which depend on air, water, soil and other non-living elements.

Effluents or Emissions: discharges of pollutants into the environment.

Endangered: a species in Saskatchewan that is threatened with immediate extinction.

Endemic Species: species that are found only in a particular area. For example, in the Athabasca Sand Dunes there are 10 plant species which are not found anywhere else in the world.

Energy Conservation: more efficient use of all energy sources (1) in lifestyles that reduce consumption by using more efficient or fewer lights, or relying less on cars, and (2) in energy production and transmission.

Energy Efficiency: maintaining the same level of services but with less energy.

Environment: everything that affects an organism during its lifetime is collectively called its environment. The environment includes soil, rock, water, air and living organisms.

Environmental Audit: an investigation and evaluation of policies, programs and actions to determine their environmental implications.

Environmental Degradation: reducing the ability of the environment to sustain life or the productivity of ecosystems.

Extirpated: species which no longer live in the wild in Saskatchewan, but which are not extinct everywhere.

Flora and Fauna: flora are all species of plants; fauna are all species of animals.

Fossil Fuels: carbon-based fuels, formed from the remains of living matter (for example, coal, oil, peat and natural gas).

Greenhouse Gases: gases, such as carbon dioxide, water vapor, trace amounts of ozone, methane, nitrous oxide and chlorofluorocarbons (CFCs), that let in visible light from the sun but prevent some of the infrared radiation or heat from escaping back into space.

Ground Water: water found in **aquifers**.

Habitat: the place or area where organisms or populations naturally live.

Hazardous Waste: any solid, liquid or gas that has the potential to harm humans, other organisms or ecosystems.

Herbicides: chemicals used to kill unwanted plants which compete with crops for nutrients or water.

Hydro Power: electricity produced from the energy of flowing water. Water flows through a turbine of spinning blades which rotate a generator, producing electricity.

Insecticides: chemicals used to kill organisms, such as insects, which threaten plants and animals.

Integrated Pest Management: the selection of the most appropriate methods of controlling pests, including biological control (for example, native parasites), cultural control (such as crop diversification) and using pest-resistant crops. Chemical pesticides can be used selectively to support non-chemical control.

Integrated Resource Management: a process which allows those who are affected by resource management decisions to have meaningful participation in protecting, developing and using resources.

Invertebrates: animals without a spinal cord.

Lagoon: a waste water lagoon or holding basin for sewage in which air, sunlight and microorganisms break down wastes, allow solids to settle and kill some disease causing bacteria.

Life-enriching Pursuits: lifestyles or activities that emphasize quality of life rather than standard of living, or conserving as opposed to consuming.

Micro-organism: any organism that can be seen only with the aid of a microscope.

Multiple Land Use: more than one use of a particular area. For example, a community pasture may be used for grazing, hunting and oil production.

Non-renewable Resources: resources whose reserves are depleted by their use, such as natural gas and oil.

Nutrient: any element or compound which an organism needs to live, grow and reproduce.

Organic Farmer: a farmer who produces agricultural products without synthetic fertilizers, pesticides or similar products.

Organism: any living plant, animal or micro-organism.

Overgrazing: feeding by too many grazing animals for too long, exceeding a grassland area's carrying capacity or ability to renew itself.

Pesticides: man-made products used to kill particular organisms (insecticides, herbicides and other biocides).

Pollutant or Contaminant: an introduced gas, liquid or solid that degrades or destroys the environment.

Population: a group of organisms of the same species, living in a particular region.

Potentially Renewable Resource: a resource whose use can be sustainable if it is properly managed.

Protected Areas: geographically defined areas in which conservation of biological diversity is a primary objective. This includes National parks, Wilderness parks and Ecological reserves. It can also include multiple use areas, such as rangelands where livestock production occurs without the loss of native biological diversity.

Pulse Crops: legume crops, such as peas, which are harvested as dried seeds and which are suitable for human consumption.

Rangeland: land that supplies forage or vegetation (grasses, grass-like plants and shrubs) for grazing and browsing animals.

Real Resource Value: the ecological, economic and social cost of using a resource. It includes the value of a resource in its natural state and the value added in processing.

Reclamation or Rehabilitation: restoring a disturbed site to a desired condition within a specific period of time.

Recycling: collecting and remelting or reprocessing a resource so that it can be made into a new product.

Renewable Resources: resources, such as forests and wildlife, that can be renewed over time, if they are properly managed.

Resource: anything which has ecological, economic and social value.

Reuse: using a resource over and over in its original form.

Salinity: the amount of various salts dissolved in a given volume of water.

Salinization: the accumulation of salts in soil or water.

Sanitary Landfill: a waste disposal site on land where wastes are spread out in thin layers, compacted and covered with a fresh layer of soil.

Selective Cutting: cutting intermediate-aged or mature trees in a forest, singly or in small groups.

Smog: a mixture primarily of sulphur dioxide, suspended droplets of sulphuric acids (formed from some of the sulphur dioxide) and a variety of suspended solid particles. Smog is found mostly in cities.

Soil Degradation: the loss of soil productivity, resulting from erosion, loss of organic matter or salinity.

Soil Erosion: the movement of soil components from one place to another, caused primarily by wind and flowing water.

Solar Cell: an energy converter which transforms sunlight into electricity.

Solid Waste: any unwanted or discarded waste material that is not liquid or gas.

Species: a group of organisms which are able to breed among themselves but unable to breed with organisms of other groups.

Stakeholders: people or groups who are interested or involved in a particular business, industry or cause.

Strategy: a process of setting goals and objectives and determining ways to achieve them.

Sustainable Development: the result of social and economic development that considers the needs and values of all interested parties, while maintaining future options and conserving natural resources and diversity.

Sustainable Energy Path: a plan for the gradual replacement of non-renewable energy sources with renewable ones. It also involves conservation of non-renewable resources.

Sustainability: the ability to sustain a resource over time. For example, sustainable deer management permits deer hunting at rates that allow deer populations to rebuild themselves.

Threatened: species that will probably become endangered if factors affecting them are not reversed.

Transboundary Approach: a cooperative approach among provinces, states or countries to manage and protect resources, such as air quality.

Ultraviolet Light: a high frequency light.

Vascular Plants: plants that have tubes or ducts to transport water and other substances from one part of the plant to another.

Vertebrates: animals which have a spinal cord and cranium or skull.

Vulnerable: species which exist in low numbers or live in restricted areas in Saskatchewan, but which are not yet threatened or endangered.

Waste Minimization: reducing wastes by practising, in order, the "4 Rs": reduce, reuse, recycle and recover.

Water Table: the top of the water-saturated portion of an unconfined aquifer.

Conversions:

acres = hectares x 2.471

inches = millimetres x 0.04

square miles = square

kilometres x 0.387